FACILITIES DESIGN CRITERIA FOR MIDAS OPERATIONAL STATION

PART I
TECHNICAL EQUIPMENT AND OPERATIONAL REQUIREMENTS

(REVISION)

Contract AF 04(647)-595

LMSD-447159-B
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(REVISION)
Contract AF 04(647)-595

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FOREWORD

This document is submitted under the provisions of Air Force Contract AF 04(647)-595, in conformance with Amendment No. 46 to the preceding Contract AF 04(647)-347, and has been prepared by Department 61-91, Base Engineering.

This report is Part I of a planned three-part document presenting facilities design criteria, the purpose of which is to provide parameters for the design of the typical MIDAS operational station. The primary objective of this Part I portion of the design criteria is to provide sufficient definition of the station technical equipment and its operational requirements to develop a design concept of the facilities, structures, and interconnecting services required by this equipment.

The present document is the second revision of LMSD-447159, dated 31 August 1959. Sections 1 and 2 of the original report were deleted in the first revision because of their classified nature. In the present revision, updated information will be indicated by vertical bars in the margin alongside the affected text.

In this Part I of the facilities design criteria, details necessary to establish specific facilities requirements for some items are not available. In these instances, it has been necessary to use conservative design parameters. These items will be monitored through their design; and as actual data become available, they will be compared with these parameters so that revisions can be made, as necessary, to assure adequacy of final design. By request of the Air Force, this document contains a listing of the technical equipment that is being planned for the MIDAS operational stations.

Part II of the facilities design criteria will contain the facilities design concept of the MIDAS operational station and will include a design analysis and detailed definitive drawings for all technical structures.

Part III of the facilities design criteria will present site-development criteria that will define the requirements for locating the technical facilities at the site and will specify the inter-facility service connection requirements.

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SECTION 1
SUMMARY OF REQUIRED FACILITIES

The following is a summary of the new technical facilities and structures that are required at the MIDAS operational station and a brief statement of the functions they will perform:

1.1 SATELLITE COMMUNICATIONS BUILDINGS

There will be three identical satellite communications buildings for housing the technical equipment required to perform the functions of automatic satellite acquisition and tracking, reception of r-f signals from these satellites, and issuing of commands to them.

1.2 ANTENNA SUPPORT STRUCTURES

A 60-foot parabolic antenna will operate with each satellite communications building. Each of the three antennas will require an antenna support structure adjacent to each satellite communications building.

1.3 RADOME SUPPORT STRUCTURES

Each of the three satellite communication antennas requires a protective radome. Three radome support structures are required.

1.4 (Deleted)

1.5 CENTRAL OPERATIONS BUILDING

A central operations building is required for receiving the incoming satellite readout data from the three satellite communications buildings and forwarding this data to the MIDAS Tracking & Control Center in the U.S.

1.6 POWER PLANT

A building is required to house diesel generators for providing emergency power to the critical technical areas. This emergency power permits the primary station functions to continue during interruptions of the principal power supply system.

SECTION 2
TECHNICAL EQUIPMENT CRITERIA

The proposed receiving antenna and radome are shown in elevation along with controlling dimensions in Figures 2-1, 2-2, 2-3, 2-4, and 2-5. The remainder of the technical equipment is listed, together with it electrical power requirement, heat dissipation, and gross weight, in Figures 2-6, 2-7, 2-8, 2-9, and 2-10. The equipment is located in plan on the same figures. Isometric views of a typical equipment rack and various items of PICE equipment are shown in Appendix A.

2.1 ARCHITECTURAL AND STRUCTURAL - GENERAL CRITERIA

2.1.1 Framing

The framing system for the building shall permit maximum flexibility for rearrangement of partitions. Columns within equipment rooms shall be avoided, and a maximum of clear space above equipment is desirable.

2.1.2 Floor Construction

Technical equipment rooms will require free-access floors, consisting of removable panels covered with vinyl linoleum. Panels shall be a 2-foot square module, conforming to the general size of technical equipment racks and allowing the floor panels to be eliminated where these racks occur. Panels shall be of laminated construction, capable of sustaining a uniform minimum load of 250 pounds per square foot and a concentrated caster load of 1000 pounds without pedestal support. A minimum space of 14 inches will be required between subfloor and panel floor grid framing members and 18 inches ($\pm$) between subfloor and top of finished floor panels. Completed panels shall be devoid of metal edging or other exposed metal protrusions,

and grounding to the floor structure shall be prohibited. Vinyl linoleum floor covering is required in designated areas to achieve the necessary 50-micron dust-particle limitation.

2.1.3 Wall and Roof Construction

Roof slope and type of roof construction must be determined on the basis of climate. Building orientation is to have gable ends facing nearby antennas; use of nonmetallic exterior roof construction is required to minimize the problem of reflectivity.

Interior walls will be of noncombustible materials and will conform to AFM-88-15 specifications. Where acoustical wall treatment is necessary, a 4-foot wainscot will be required. The wainscot shall withstand abuse, marring, and require a minimum of repainting. Sound-absorbing fiberglass blankets shall be placed behind the wainscot where acoustical treatment of walls is required.

2.1.4 Doors

The minimum dimensions of doors to rooms containing technical equipment, or through which equipment must pass, will be 6 feet 0 inch in width and 8 feet 0 inch in height. Knockout panels will be required in exterior walls, as designated, with a minimum height of 8 feet 0 inch.

2.1.5 Ceilings

Technical operations will require acoustical ceilings in certain areas. Metal-pan acoustical units are recommended to insure dust control, due to their non-flaking property, and flexibility for rearrangement.

2.1.6 Noncombustible Materials

Except where use of combustible materials is unavoidable, all construction materials will be noncombustible. Frames, shelving, bins, racks, and

similar units will be metal; insulation, adhesive, paint materials, and all surface materials will be selected for their noncombustible characteristics.

2.2 ARCHITECTURAL AND STRUCTURAL - SPECIFIC CRITERIA

2.2.1 Antenna Support Structure Design Criteria

Each antenna support structure shall have a minimum height of 20 feet above grade, and the top of the support structure must be at or above the elevation of the highest structure within a radius of 200 feet. The support structure shall be provided with an outside access ladder to the top platform and with adequate interior lighting.

The distance from the center of the antenna support structure to the face of the satellite communication building will be from 55 to 65 feet.

The following antenna support structure design criteria are based on the best information available, as the antenna currently is in the design stage. In computing wind loads, 90-knot winds have been assumed as maximum but this should be adjusted to site conditions.

Antenna Design Loads and Dimensions

Max. Antenna Total Gross Weight (Including Pedestal)	300,000 lb
Min. Antenna Total Gross Weight (Including Pedestal)	90,000 lb
Heaviest Component	18,000 lb
Antenna Mounting Height (Base of Pedestal to Center of Reflector)	40 ft 0 in.
Min. Distance From Bottom of Reflector to Ground Level	30 ft 0 in.
Antenna Reflector Diameter	60 ft 0 in.
Max. Overturning Moment Due to Accelerating and Decelerating Inertia of Antenna Reflector	23,000 ft/lb

Although the antenna will be covered by a protective radome, it is probable that there will be periods when the radome may be removed, exposing the antenna to the elements. For this reason, the following is additional criteria for designing the antenna support structure to withstand wind loads as shown.

**Wind Loads Due to 50-Knot Wind, Antenna Operational*
(With Reflector Sighting Axis Horizontal)**

Horizontal Drag	35,000 lb
Vertical Uplift on Reflector	10,000 lb
Overturning Moment	1,600,000 ft/lb

**Wind Loads Due to 90-Knot Wind, Antenna Stowed*
(With Reflector Sighting Axis Vertical)**

Horizontal Drag	61,000 lb
Vertical Uplift on Reflector	57,000 lb
Overturning Moment	2,700,000 ft/lb

2.2.2 Antenna Base Mounting Details (Fig. 2-1)

Rigidity requirements are as follows:

a. Maximum allowable temporary rotation of the top of the support structure due to the effects of a 50-knot wind when antenna is operational (antennas will be stowed in winds above 50 knots): 0.15 milliradian

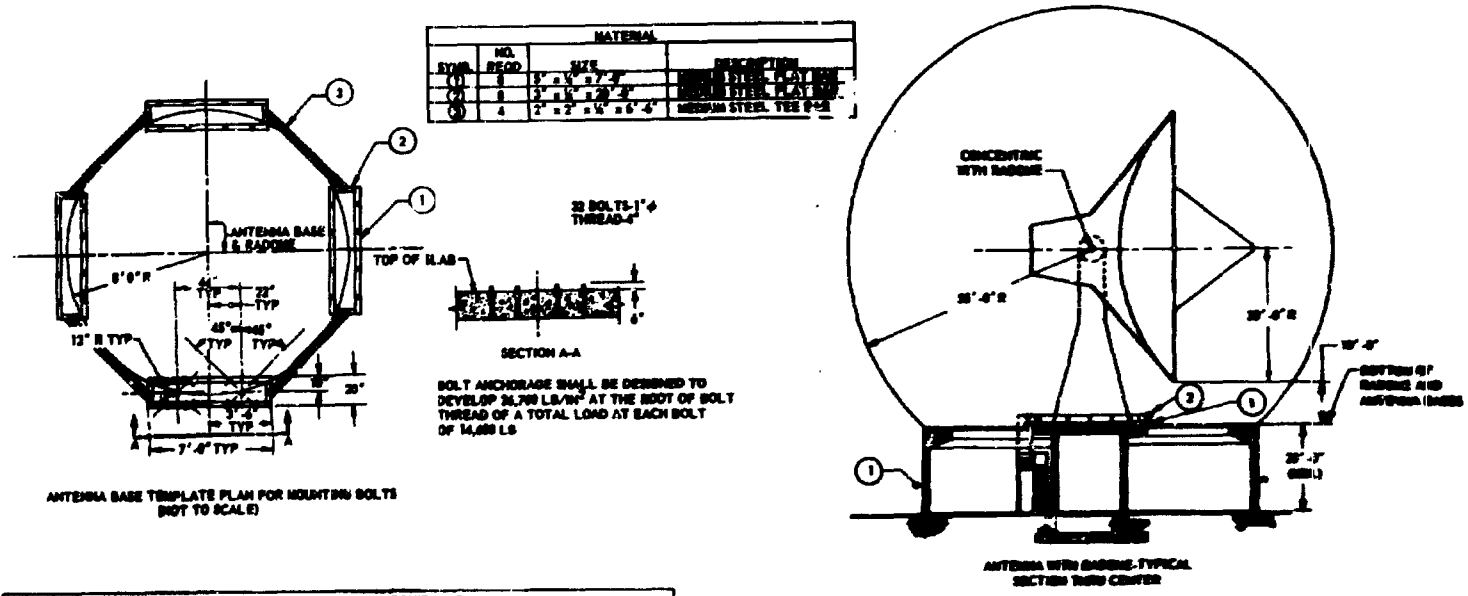
b. The structure should not permanently deflect, settle, or rotate under the effects of a 90-knot wind with antenna stowed

c. To insure against excessive long-term settlements of the structure foundations, the bearing soil strata should be capable of supporting a load equal to twice the design load for a period of at least 48 hours without settlement.

2.2.3 Radome Support Structure Design Criteria

The radome support structure must carry the dead weight of the radome plus loads due to wind. These loads are delivered to the support structure as

* Wind overturning moments are taken about the centerline of the antenna pedestal base. They include the effects of both horizontal and vertical wind-force components. The wind angle-of-attack is assumed at 15 degrees upward from horizontal, which yields load values larger than loads produced by a horizontal wind. Assumed wind velocities are based on maximum gust velocity.



TECHNICAL COLLATERAL DISPICINT			
ITEM	DESCRIPTION	VOLTAGE (3ø~)	TOTAL LOAD
01	AUX. RECEPTACLES - 5 CKT @ 1.5 KW	115V - 1ø	7.5 KW
02	RADOME HEAT LAMPS 4 CKT @ 20 KW	115/200V 3ø	160.0 KW
	60' ANTENNA DRIVE	230V - 3ø	15 HP

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Figure 2-1 Antenna Mounting Details

membrane stresses acting in the plane of the radome surface. Vertical components must be carried in compression by the support structure walls to the foundations. Horizontal components must be carried by the top portion of the support structure acting as a structural ring. The structural ring must resolve the horizontal components into shear loads that are carried in shear by the support structure walls to the foundations.

Design loads and base details, based on a 150-mph wind, are shown below and in Figures 2-2, 2-3, 2-4 and 2-5. The 150-mph wind has been assumed as maximum but this should be adjusted to site conditions.

Radome Total Dead Weight	200,000 lb
Equatorial Diameter	110 ft 0 in.
Minimum Equipment Access Door Size	13 ft 0 in. high by 16 ft 0 in. wide

Radome support structure floor shall be a concrete slab designed for maximum loaded 10-ton-capacity, rubber-tired, mobile crane, in any position within the support structure. Minimum slab thickness shall be 6 inches.

Equipment access door requires locks to prevent personnel entry during operational periods and preventing injury from command transmitting radiation.

2.2.4 (Deleted)

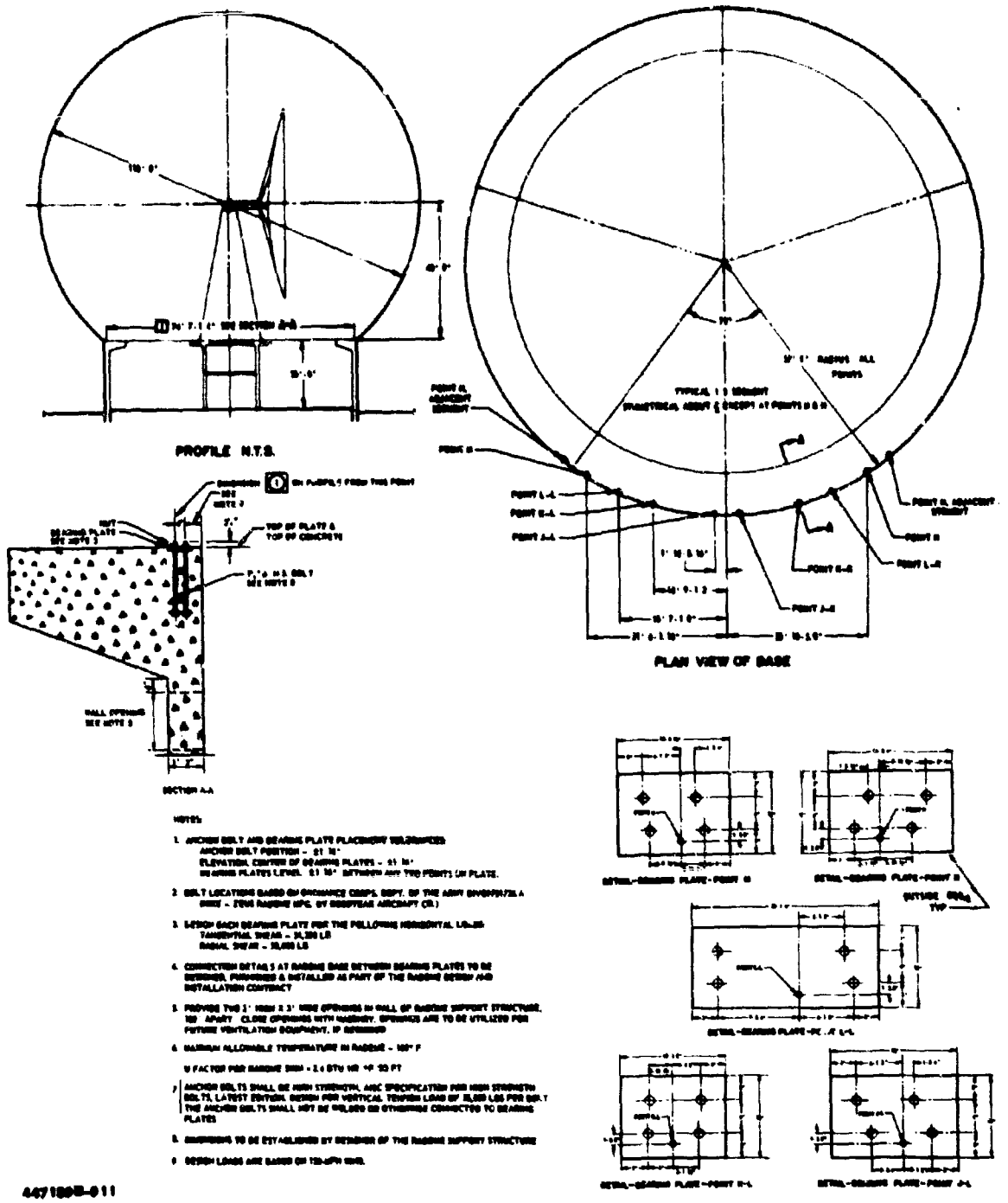

Figure 2-2 Test Tracking Stations, Radome Criteria – 110-foot Space Frame

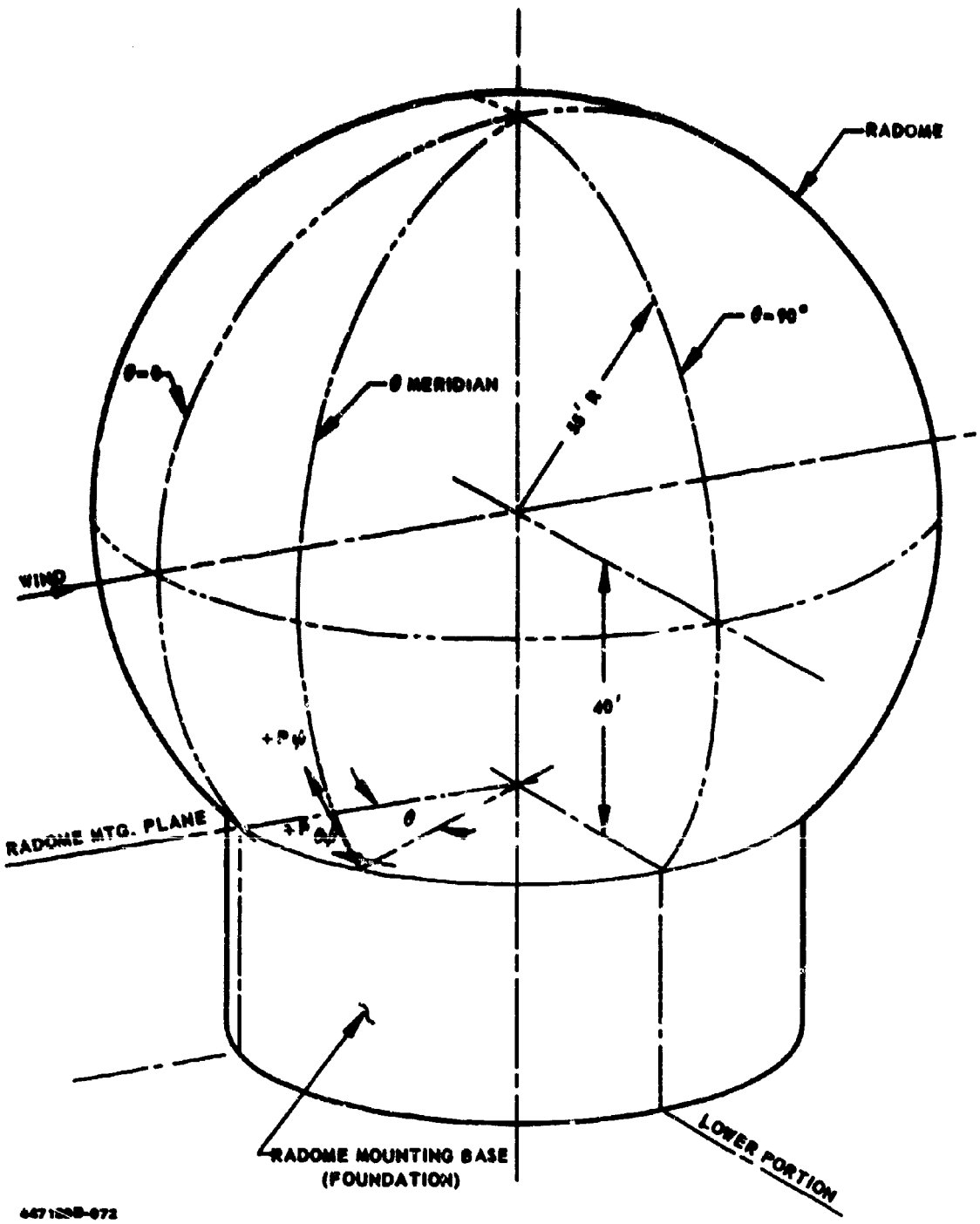

Figure 2-3 Radome Configuration

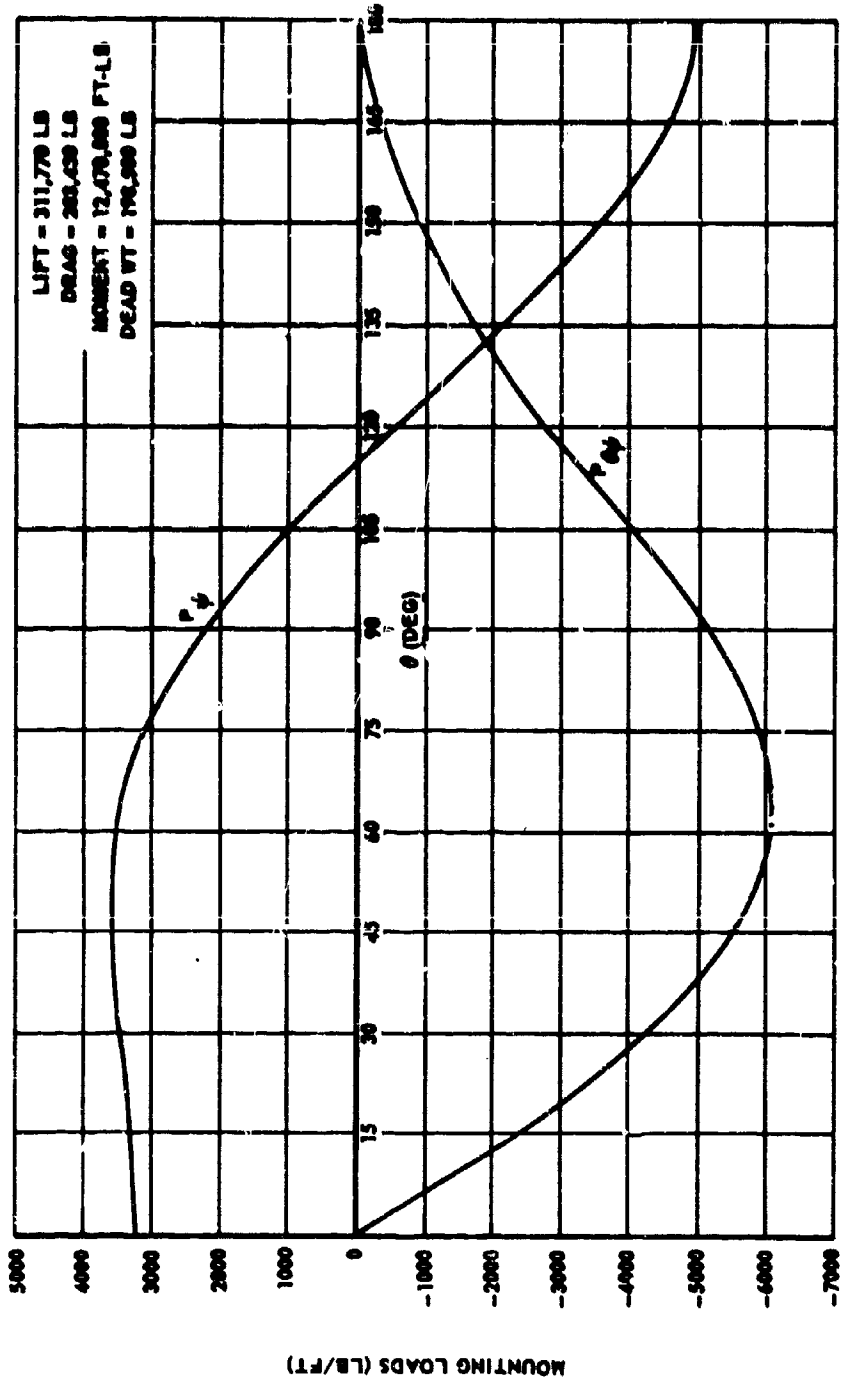

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Figure 2-4 Radome Mounting-Base Load Distribution

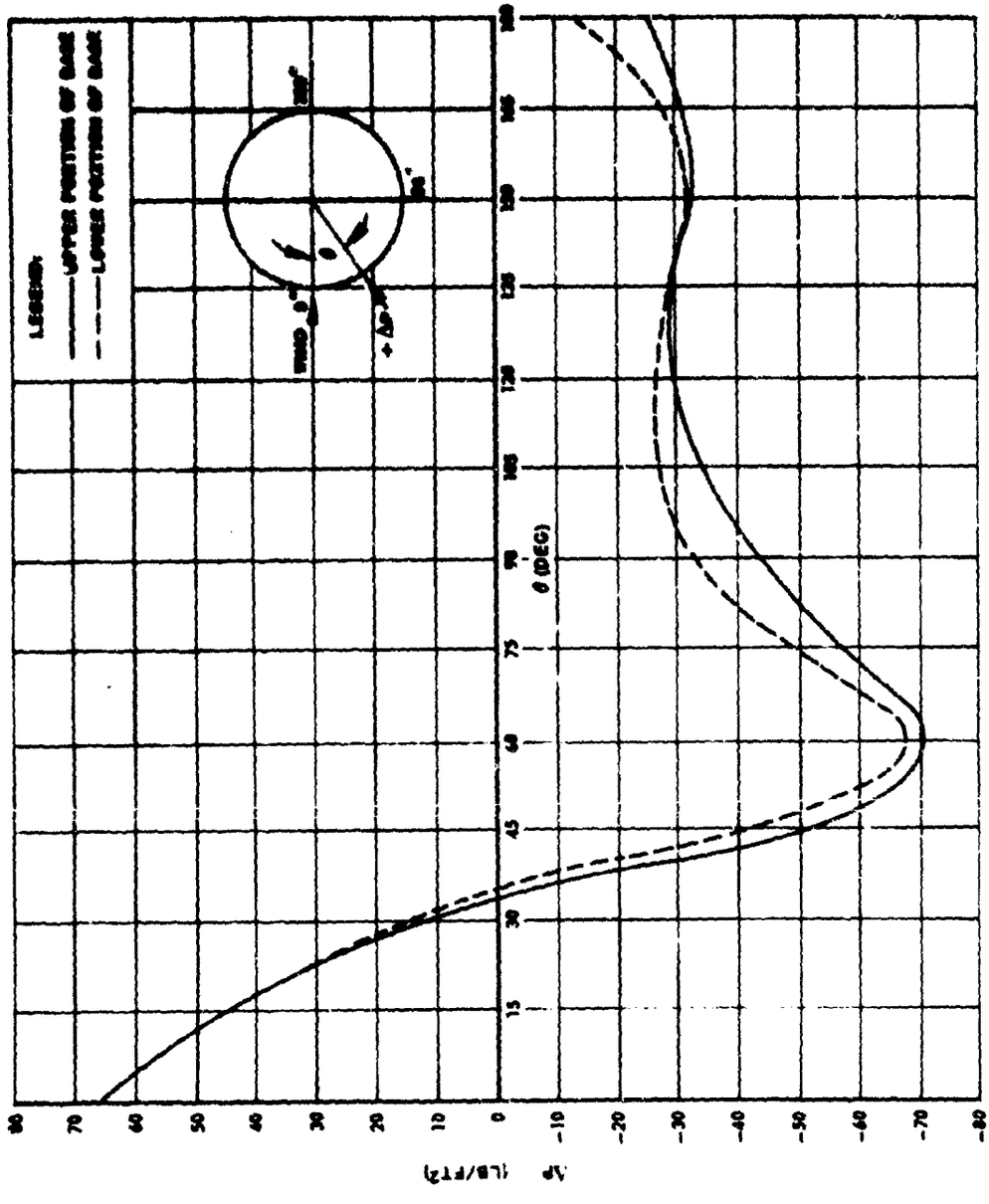


Figure 2-5 Rodome Base Pressure Distribution

2.2.5 Central Operations Building

2.2.5.1 Data Conversion Room (Fig. 2-6). Signals received from MIDAS satellites will be conducted from the three receiving transmitting areas via intra-site instrumentation cabling to the date conversion room. Technical equipment housed in this room will accept these data and convert them to a form suitable for recording, storage, and/or transmission to the MIDAS Tracking & Control Center via commercial communications facilities. Acoustical treatment of walls and ceiling is an operational requirement.

Special room requirements are as follows:

a. Floor: free-access panels with vinyl linoleum finish
b. Base: rubber
c. Walls: acoustical tile
d. Wainscot: 4 ft high, durable material
e. Ceilings: acoustical tile
f. Ceiling height: 10 ft 0 in.
g. Painted surfaces: nonflaking, noncombustible character
h. Maximum allowable noise level: 70 decibels.

Number of personnel utilizing room is as follows:

a. One digital interpolator operator (full time)
b. One timing technician (part time)
c. Two magnetic tape operators (one part time, one full time)

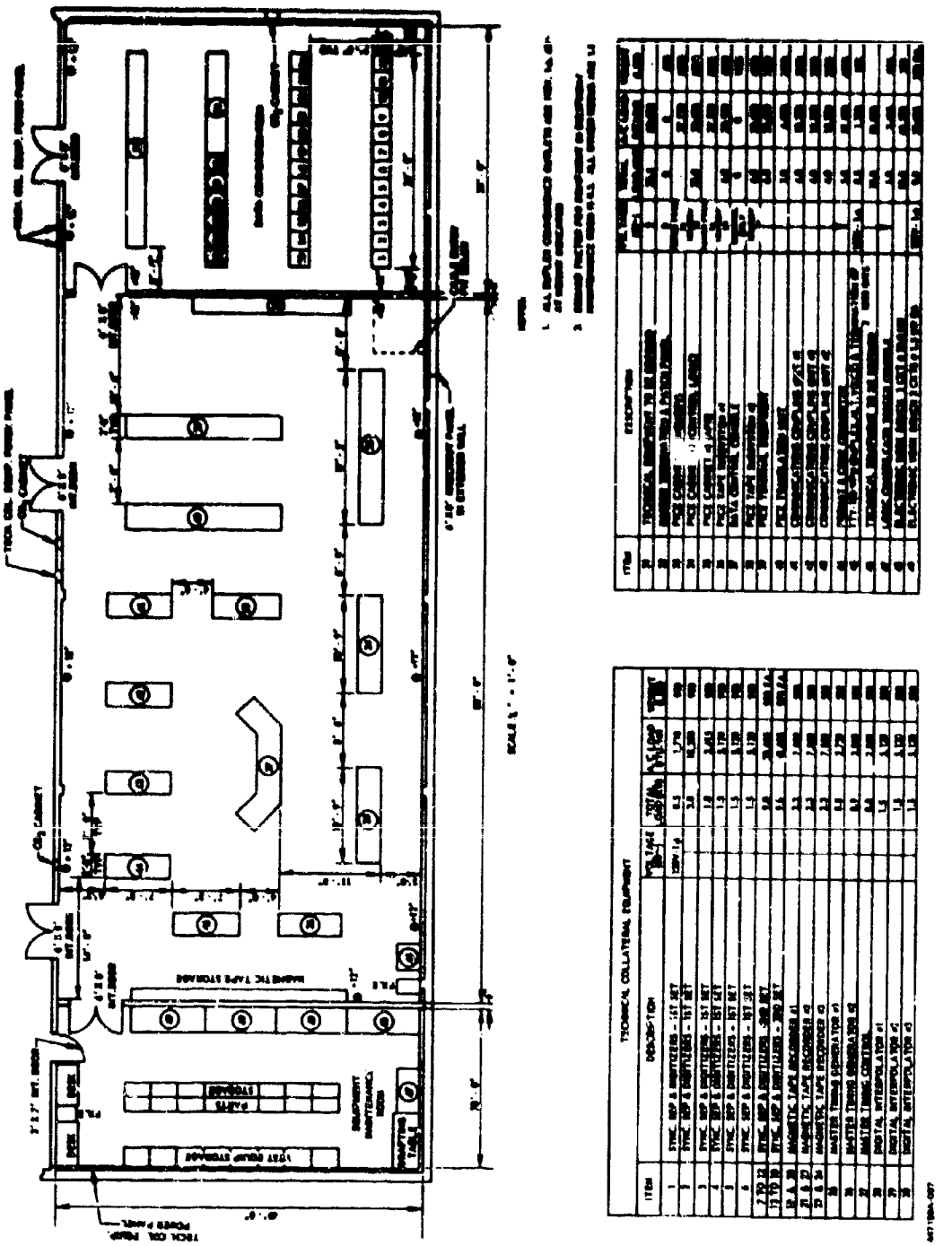


Figure 2-6 Equipment Rooms – Central Operations Building

d. One telemetry technician (part time)
e. One central operations supervisor (part time)
f. One digitizer specialist (full time).

2.2.5.2 Data Control Room (Fig. 2-6). Programmable integrated control equipment (PICE) will be located in this room. This equipment serves to control and sequence automatically the flow of data to and from the various technical equipment. Interconnecting signal and power cables enter PICE under the cabinets and will require a clear, under-floor space. Cabling will connect PICE and other areas within the building. PICE terminal equipment must be located adjacent to the date conversion room to minimise cabling. Acoustical treatment of walls and ceiling is an operation requirement.

Special room requirements are the same as those listed for the data conversion room. Number of personnel utilizing room is as follows:

a. One data control console operator (part time)
b. One command processor operator (part time)
c. One teletype operator (full time)
d. One automatic communications technician (part time)
e. One central operations supervisor (part time)
f. One digital interpolator operator (full time).

2.2.5.3 Equipment Maintenance Room (Fig. 2-6). PICE and technical equipment racks will be maintained, rebuilt, and reconditioned in this room. Proximity to data control room and data conversion room is desired. Size, weight, and delicateness of equipment prohibits transporting to remote locations.

As an expansion area for the data control room, the same room requirements apply. Acoustical treatment of walls above the wainscot is not required for the maintenance function, but should be added if the area becomes part of the data control room.

Number of personnel utilizing room is as follows:

a. One digitizer specialist (full time)
b. One command processor operator (part time)
c. One data control console operator (part time)
d. One automatic communications technician (part time).

2.2.5.4 Ground/Space Communications Control Room (Fig. 2-7). The ground/space control room will house the tracking and acquisition control console. This console will serve as a control point at which the operational status of all technical equipment will be displayed and from which major station functions will be controlled. Intercommunication circuits built into this unit will enable operating personnel to communicate with the MIDAS Tracking & Control Center. Acoustical treatment of walls and ceiling is an operational requirement.

The ground/space communications control room shall be centrally located, easily accessible to all technical areas. From this area, corridor access to the message center in the communications room and data control room is desirable.

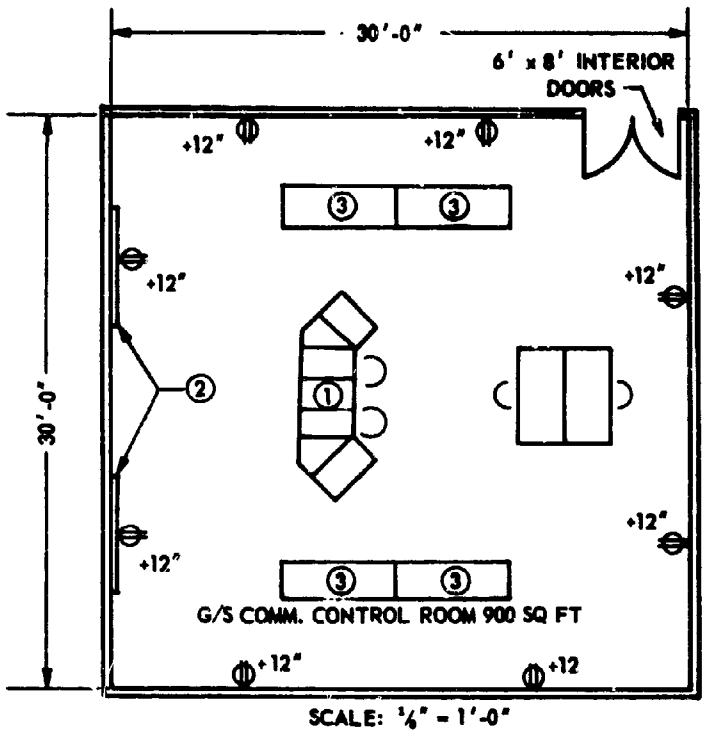
Special room requirements are the same as those listed for the data conversion room. Number of personnel utilizing room is as follows:

a. One T & A control console operator (full time)
b. One control operations supervisor (part time).

2.2.5.5 Communications Room (Fig. 2-8). Radio and telephone communications will terminate in this room, which will serve as the communications center for the tracking station.

Special room requirements are as follows:

a. Floor: free-access panels with vinyl linoleum finish
b. Base: rubber
c. Walls: gypsum board
d. Wainscot: none



TECHNICAL COLLATERAL EQUIPMENT					
ITEM	DESCRIPTION	VOLTAGE (60~)	TOTAL CONN. LOAD (KW)	A/C LOAD BTU/HR	TOTAL WEIGHT (LBS)
①	TRACKING & ACQUISITION CONTROL CONSOLE	120V., 1φ	1.0	3,415	3,600
②	STATUS BOARDS	---	---	---	200 EACH
③	TECHNICAL EQUIP TO BE DEFINED - 2 CIRCUITS @ 1.5 KW	120V., 1φ	3.0	10,200	

NOTES:
1- ALL DUPLEX CONVENIENCE OUTLETS ARE 110V., 1φ 60 ~ AT HEIGHT INDICATED
2- DEMAND FACTOR IS 1.0.

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Figure 2-7 Ground-Space Communications Control Room – Central Operations Building

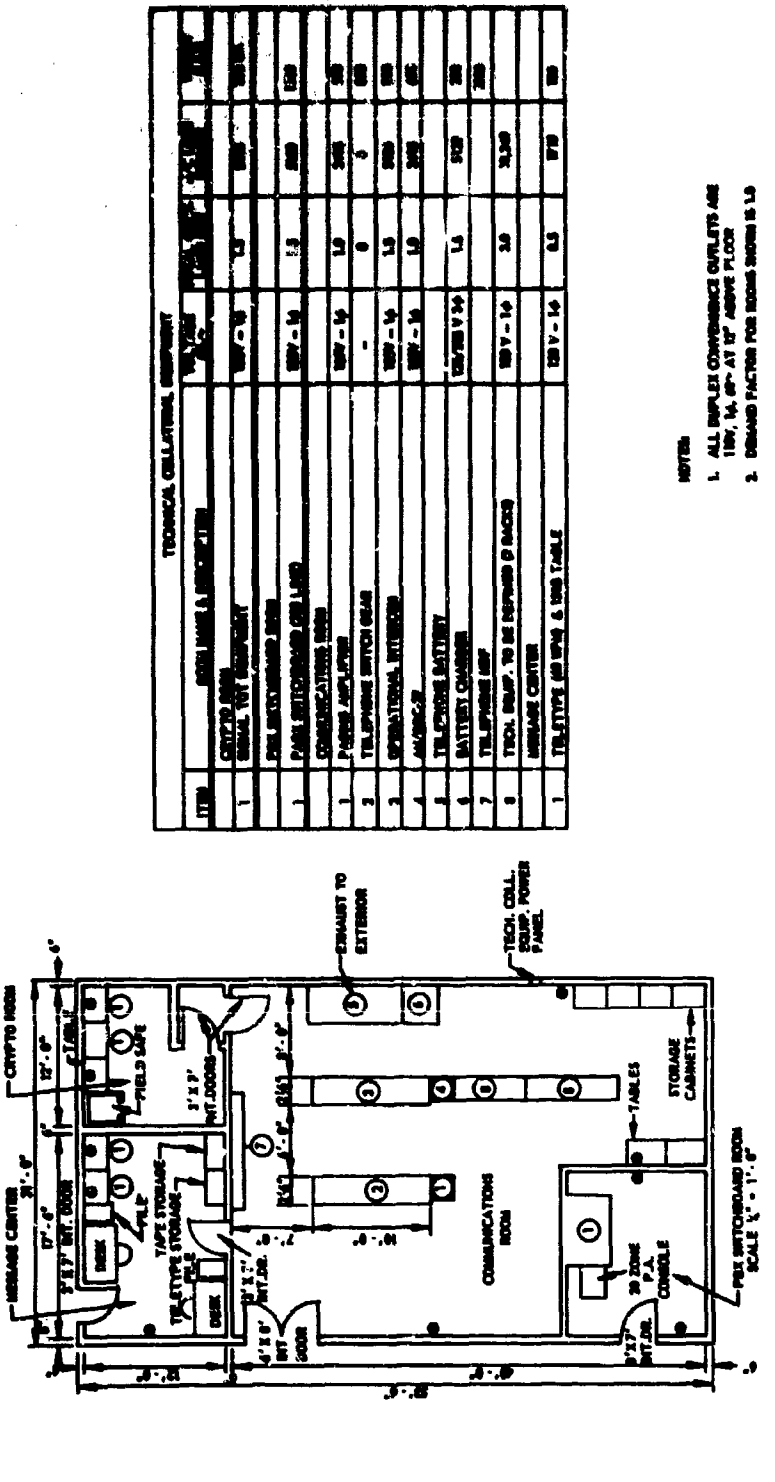


Figure 2-8 Communications Area – Central Operations Building

e. Ceilings: gypsum board
f. Ceiling height: 10 ft 0 in.
g. Painted surfaces: nonflaking, noncombustible character.

Number of personnel utilizing room: One automatic communications technician (part time).

2.2.5.6 Message Center (Fig. 2-8). This room will house the administrative teletype. Special room requirements are as follows:

a. Floor: free-access panels with vinyl linoleum finish
b. Base: rubber
c. Walls: soundproof drywall with acoustical tile
d. Wainscot: none
e. Ceiling: acoustical tile
f. Ceiling height: 9 ft. 0 in.
g. Maximum allowable noise level: 70 decibels (500 ~ to 2000 ~)

Number of personnel utilizing room: One teletype operator (full time).

2.2.5.7 Crypto Room (Fig. 2-8). Classified communication circuits will be terminated on Sig-Tot equipment in this room. Classified crypto tapes will be stored here. Security requires concrete-vault construction. Specifications and regulations outlined in AFM 88-15 and AFR 205-1 governing construction details will apply.

Special room requirements are as follows:

a. Floor: concrete with asphalt tile
b. Base: rubber
c. Walls: acoustical tile on concrete
d. Wainscot: none
e. Door: record-vault type
f. Ceiling: acoustical tile suspended from a concrete ceiling
g. Ceiling height: 9 ft 0 in.
h. Maximum allowable noise level: 70 decibels (500 ~ to 2000 ~)

Number of personnel utilizing room: One cryptographic operator (full time).

2.2.5.8 PBX Switchboard Room (Fig. 2-8). A two-position manually operated telephone switchboard is located in this room to accommodate administration off-site calls.

Special room requirements are as follows:

a. Floor: free-access panel with vinyl linoleum finish
b. Base: rubber
c. Walls: gypsum board
d. Wainscot: none
e. Ceiling: gypsum board
f. Ceiling height: 9 ft 0 in.

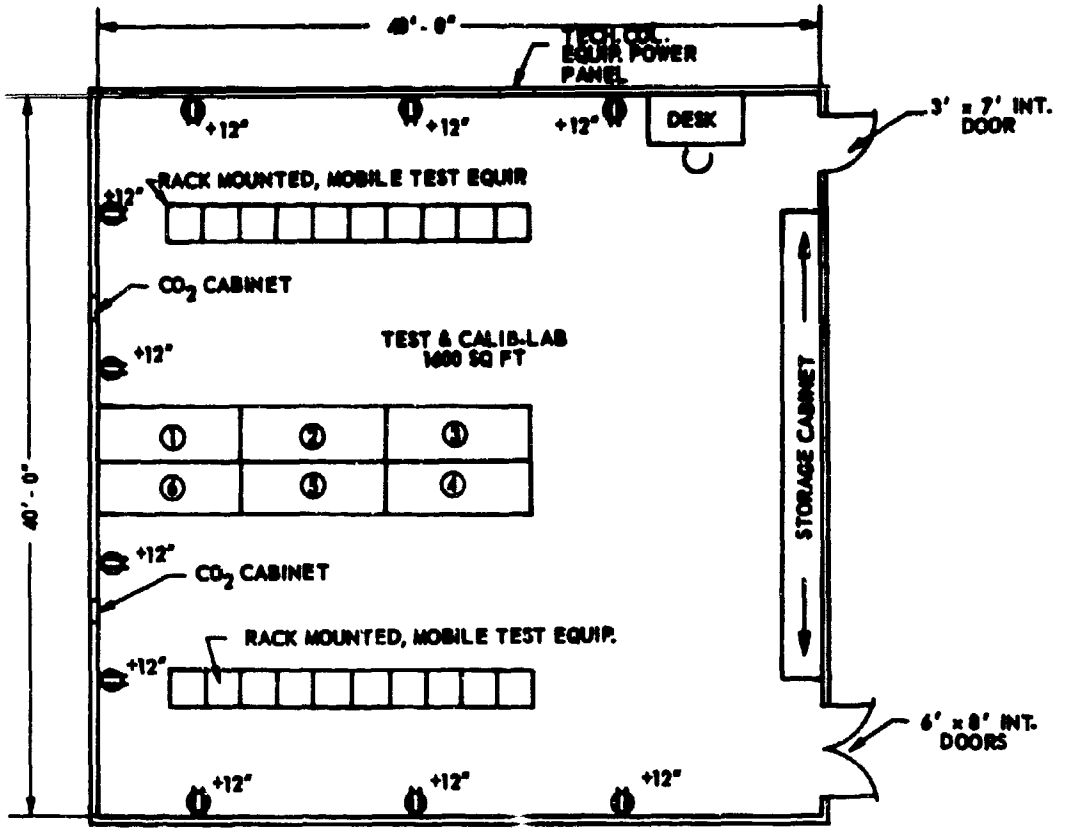
Number of personnel utilizing room: One switchboard operator (full time).

2.2.5.9 Test and Calibration Laboratory (Fig. 2-9). Calibration of test equipment and precision measurement standards used in the performance of maintenance and calibration functions will be performed in this room. This area should be located near the Equipment Maintenance Room to facilitate expansion of the maintenance function in an emergency condition. Location near the Data Control room would be desirable also. Should the Data Control facility expand into the Equipment Maintenance area, the Test and Calibration Laboratory would be the ideal location for absorbing the maintenance function.

The design and environmental conditions for a Test and Calibration Laboratory will be dependent on accessibility to a Primary Standards Laboratory. If a Primary Standards Laboratory is located convenient for motor or plane access, this Test and Calibration Laboratory should be designed as a Secondary Standards Laboratory as outlined below and in Section 2.3.2 Technical Equipment Area.

Room requirements are as follows:

a. Floor: free-access panels with vinyl linoleum finish
b. Base: rubber
c. Walls: gypsum board



SCALE: ¼" = 1'-0"

TECHNICAL COLLATERAL EQUIPMENT					
ITEM	DESCRIPTION	VOLTAGE (60~)	TOTAL CONN. LOAD (KW)	A/C LOAD BTU/HR	WEIGHT (LBS)
①	TEST BENCH 2 CIRCUITS @ 1.5 KW	120V, 1φ	3.0	7,240	200
②	TEST BENCH 2 CIRCUITS @ 1.5 KW		3.0	7,240	200
③	TEST BENCH 2 CIRCUITS @ 1.5 KW		3.0	7,240	200
④	TEST BENCH 2 CIRCUITS @ 1.5 KW		3.0	7,240	200
⑤	TEST BENCH 2 CIRCUITS @ 1.5 KW		3.0	7,240	200
⑥	TEST BENCH 1 CIRCUIT @ 18 KW	120/208V, 3φ	18.0	43,440	200
	MOBILE TEST EQUIP – 20 RACKS @ 1 KW	120V, 1φ	20.0	68,260	30 EA

NOTES:

1 - ALL DUPLEX CONVENIENCE OUTLETS ARE 110V, 1φ, 60~ AT HEIGHT INDICATED

2 - DEMAND FACTOR FOR LAB IS 0.5

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Figure 2-9 Test and Calibration Laboratory – Central Operations Building

d. Wainscot: none
e. Ceiling: gypsum board
f. Ceiling height: 10 ft 0 in.

Number of personnel utilising room:

a. One timing technician (part time)
b. One magnetic tape operator (part time)
c. One telemetry technician (part time).

2.2.5.10 Security Office: Security requirements dictate the need of a central security control point. This control may be an outside security check house, or an office located at the lobby entrance of the central operations building, or a combination of both, dependent on location and distance involved. A one man office of approximately 80 square feet will suffice within the central operations building.

2.2.5.11 Technical Office Space Requirements. Office space is required in the central operations building for the following personnel who will be directly engaged in the technical functions of the station:

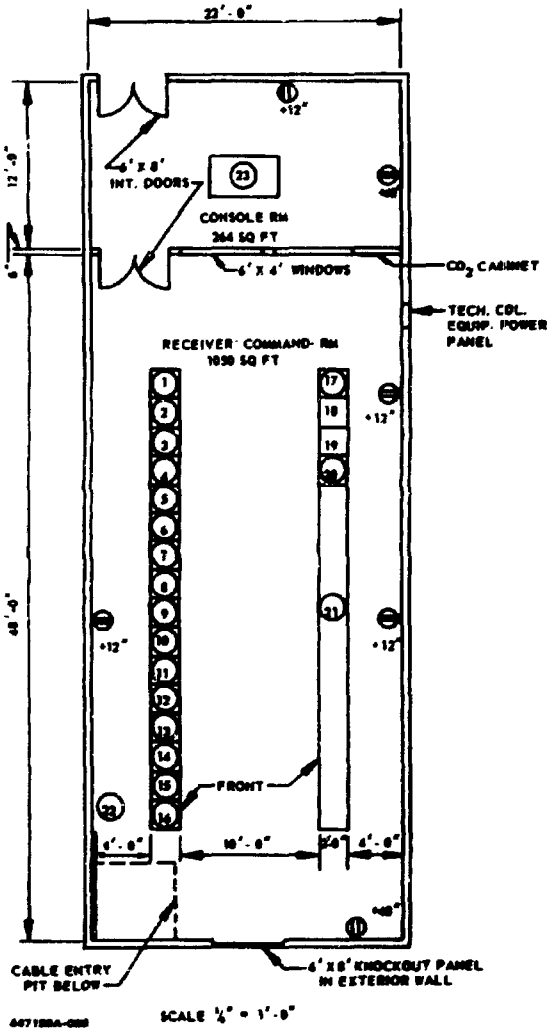
a. One technical operations supervisor and four shift supervisors
b. Five field engineers
c. Two clerk typists
d. Five (to be determined).

2.2.6 Satellite Communications Buildings. (Three Required)

2.2.6.1 Receiver/Command Room (Fig. 2-10). Receiving, command-transmitting, and antenna-servo and control equipment will be located in this room. Inter-connection will be made with the adjacent console room and their respective antennas.

Room requirements are as follows:

a. Floor: free-access panels with vinyl linoleum finish
b. Base: rubber
c. Walls: acoustical tile



TECHNICAL COLLATERAL EQUIPMENT

ITEM	DESCRIPTION	VOLTAGE (60~)	TOTAL LOAD (KW)	A/C LOAD BTU/HR	TOTAL WEIGHT (LBS)
1	UHF MB DATA LINK RECEIVER "A"	120V, 1Ø	1.2	4,100	200
2	UHF MB DATA LINK RECEIVER "B"		1.2	4,100	200
3	UHF MB DATA LINK RECEIVER CONTROL "A"		1.0	3,415	200
4	UHF MB DATA LINK RECEIVER CONTROL "B"		1.0	3,415	200
5	UHF RECEIVER "A" & "B" TRACKING COMPONENTS		1.0	3,415	200
6	MOBILE TEST EQUIPMENT		1.0	3,415	200
7	DATA LINK RECEIVER TEST		1.2	4,100	200
8	DATA LINK RECEIVER TEST		1.2	4,100	200
9	COMMAND TRANSMITTER CONTROL		1.0	3,415	200
10	UHF COMMAND POWER SUPPLY		1.0	3,415	200
11	COMMAND TRANSMITTER EXCITER		1.0	3,415	200
12	UHF COMMAND POWER AMPLIFIER		0.1	1,020	200
13	COMMAND & RECEIVE ANTENNA CONTROL #1		2.1	7,200	200
14	COMMAND & RECEIVE ANTENNA CONTROL #2		0.9	3,720	200
15	ANTENNA SLAVE DATA EQUIPMENT #1		0.5	1,710	200
16	ANTENNA SLAVE DATA EQUIPMENT #2		0.5	1,710	200
17	DATA DISTRIBUTION	—	0	—	200
18	TIM[illegible] TERMINAL & DISPLAY	120V, 1Ø	1.0	3,415	200
19	COMMUNICATIONS TERMINAL		0.5	1,710	200
20	ANTENNA ALIGNMENT EQUIPMENT		1.4	4,800	200
21	TECHNICAL EQUIPMENT TO BE DEFINED (12RACKS @ 1.5 KW)		18.0	61,500	200
22	MASTER TERMINATION & PATCH PANEL	—	0	—	200
23	MASTER T & R CONTROL CONSOLE	120V, 1Ø	1.5	5,100	1000

NOTES:

1. ALL DUPLEX CONVENIENCE OUTLETS ARE 110V, 1Ø, 60~ AT HEIGHT INDICATED
2. DEMAND FACTOR IS 1.0

Figure 2-10 Equipment Rooms – Satellite Communications Building

d. Wainscot: 4 ft height - durable material
e. Ceilings: acoustical tile
f. Ceiling height: 10 ft 0 in.
g. Maximum allowable noise level: 70 decibels (500 ~ to 2000 ~).

Number of personnel utilizing room:

a. One satellite communication operations supervisor (part time)
b. One receiver equipment technician (full time)
c. One data receiver/transmitter technician (full time)
d. One digital equipment technician (full time)
e. Hydraulic systems specialist (full time)
f. One receiver equipment technician (full time - in third Sat. Comm. Bldg.).

2.2.6.2 Console Room (Fig. 2-10). The master transmitting and receiving control console will be in the center of this room. Windows between the console room and adjacent receiver-command room will allow the operator visual control of both rooms.

Room requirements are the same as listed for the receiver-command room.

Number of personnel utilizing room:

a. One satellite communications operations supervisor (part time)
b. One antenna control console operator (full time).

2.2.6.3 Technical Office Space Requirements. Office space is required in each of the satellite communications buildings for the following technical personnel who will be directly engaged in the technical operation of the station:

a. One satellite communications operations supervisor and 4 shift supervisors
b. Five field engineers.

2.3 HEATING, VENTILATING, AND AIR CONDITIONING

2.3.1 Non-Technical Equipment Areas

Non-technical areas will require heating and ventilating only. The total air change rate will be based on heating requirements but in no case will be less than the minimums described in AFM-88-15. Temperatures will be maintained at levels established in AFM-88-15.

The outside air supply will be made capable of providing 100-percent outside air for summer ventilation, and modulated to the minimums conforming to AFM-88-15 during the winter heating cycle.

All spaces will be maintained at a positive pressure with respect to site barometric pressure.

2.3.2 Technical Equipment Areas

All rooms containing technical equipment will be provided with air conditioning to maintain the temperature and humidity in these rooms within the following limits:

a. All technical equipment rooms except the Data Control Room and Test and Calibration Laboratory

(1) Normal operating temperature	72° F.
Allowable deviation	±2° F.
(2) System to permit flexible control point to	80° F.
(3) Relative humidity	
Maximum	50%
Design Premise	45%
Minimum	30%

b. Data Control Room

(1) Temperature design premise	72° F.
Allowable deviation	±2° F.

(2)	Relative humidity design premise Allowable deviation	45% ±5%

c. Test and Calibration Laboratory

(1)	Temperature design premise Allowable deviation	73° F. ±2° F.
(2)	Relative humidity design premise Allowable deviation	40% ±5%

The requirements for the data control room and test and calibration room are more restrictive than those in the other areas because these rooms contain transistorized electronic equipment which is highly temperature sensitive. Humidity control is necessary to prevent moisture grounding of equipment and the formation of static electricity.

2.3.3 Air Conditioning Equipment

Air conditioning equipment located in mechanical equipment rooms and fan houses will furnish conditioned air to the technical equipment rooms by duct systems. Consideration should be given to the use of multiple fan houses recessed in the building roof. Each system or subsystem to be sized for a 50 percent possible increase in capacity including coil face area, blower C. F. M., and the primary loop of both hot and chilled water distribution systems. The foregoing design philosophy will permit greater flexibility in making the changes necessary to keep pace with the advancing technology of the Satellite Systems Program.

The basic air conditioning system shall be able to provide up to 100 percent outside air to the coil(s) when room exhaust air is warmer than outside air and to return up to 80 percent exhaust air when the outside air is warmer than room exhaust air. No standby H&V equipment will be required for this class of facility.

2.3.4 Supply Zoning

The air supply grilles and diffusers and return registers shall be designed to a pattern to permit optimum flexibility for rearrangement and replacement

of technical equipment.* Zoning of supply systems shall be done on the basis of providing separate zones for rooms where air quantities and/or temperature differentials, due to intermittent utilization of equipment, clearly indicate the incompatibility of multiple rooms on a single zone.

2.3.5 Filtration

Air filtration will be employed for all systems. Rooms containing technical equipment shall have supply air filtered to exclude all particles 50 microns or larger. It is suggested that electrostatic precipitators be employed in the air conditioning systems serving rooms which have tape subsystems, such as the data control and data conversion rooms.

Cooling requirements imposed by technical equipment are given in BTU/H on room drawings. Air conditioning systems will be designed to handle their loads in addition to non-technical, lighting and building loads.

2.3.6 Refrigeration

When the air conditioning load on a building is 25 tons or more, consideration should be given to the economic feasibility of a central chilled water system. The use of water chilling units employing reciprocating compressors should be limited to factory assembled and tested packages with sealed refrigerant circuits.

2.3.7 Water Supply

A study should be made of the water supply. Consideration should be given to cost, hardness, availability, and local regulations relative to the use of the supply in order to determine whether or not evaporative condensers, cooling towers, and water softening equipment are required. Where such equipment is required, suitable provisions may be needed to prevent the formation of algae and the accumulation of solids.

* Technological advances resulting from the research and development portions of the satellite programs have shown that flexibility is mandatory.

2.3.8 Controls

The sequence of operation of automatic controls should be completely and clearly described in the specifications and should be supplemented with a control diagram on the drawings.

2.3.9 Radome Heating

Provision should be made to heat each radome structure against icing conditions. A minimum of four 25 KVA circuits for each structure should be provided to power banks of infra-red heat lamps.

Maximum allowable temperature inside radome is 105° F.

2.3.10 Ventilation

Two foot 0 inch high by 3 foot 0 inch wide openings should be provided, 180 degrees apart, in the wall of the radome support structure for ventilation purposes. These will be closed with masonry to provide for future ventilation equipment, if required.

2.4 ELECTRICAL INSTRUMENTATION AND COMMUNICATIONS

2.4.1 General Power Requirements

2.4.1.1 Reliability. Station commercial power shall not experience more than 12 outages per year, the majority of which will be cleared within one minute, and with little likelihood of more than two outages being for more than two hours duration. On site power generation shall be provided for technical equipment and other essential loads after outages of more than 60 seconds have occurred. After loss of station commercial power, switch transfer and diesel startup sequence shall not be initiated until after a 10-second delay. This delay is required to eliminate possible power transfer due to momentary loss of station commercial power. On site power shall be on line within 60 seconds after loss of station commercial power.

2.4.1.2 Regulation at Technical Collateral Equipment (T.C.E.)

a. Maximum allowable voltage fluctuation at T.C.E. ±10%
b. Maximum allowable frequency variation: ±1 cps.

2.4.1.3 Distribution Voltages

a.	Primary Distribution	*
b.	Technical collateral equipment	120/208v-3φ - 60 cycles
c.	Mechanical equipment	*

2.4.1.4 Frequency Conversion. If other than 60 cycle power is supplied to each building substation, frequency converters shall be required. These converters shall be located in each building to supply the technical equipment panels with 60 cycle power.

2.4.1.5 Distribution of Loads in Buildings. Building power distribution shall be arranged in such a manner so that T.C.E. and other critical loads can be isolated from non-critical loads under emergency power conditions. Feeders to T.C.E. areas shall have maximum flexibility in regard to relocation of load points brought about by relocation of equipments. Plug-in busway is recommended for this use.

2.4.1.6 Emergency Power. An emergency engine-generator shall be installed in a central location which will have a capability of carrying all critical load in event of loss of utility power. Transfer to emergency power and isolation of critical loads at each building shall be automatically accomplished as shown on Figure 2-11.

Emergency power will supply:

a. Critical T.C.E. loads (includes radome heating)
b. Air conditioning loads for T.C.E. (including growth allowance)
c. Minimum lighting to perform functions.

* *To be determined by availability.*

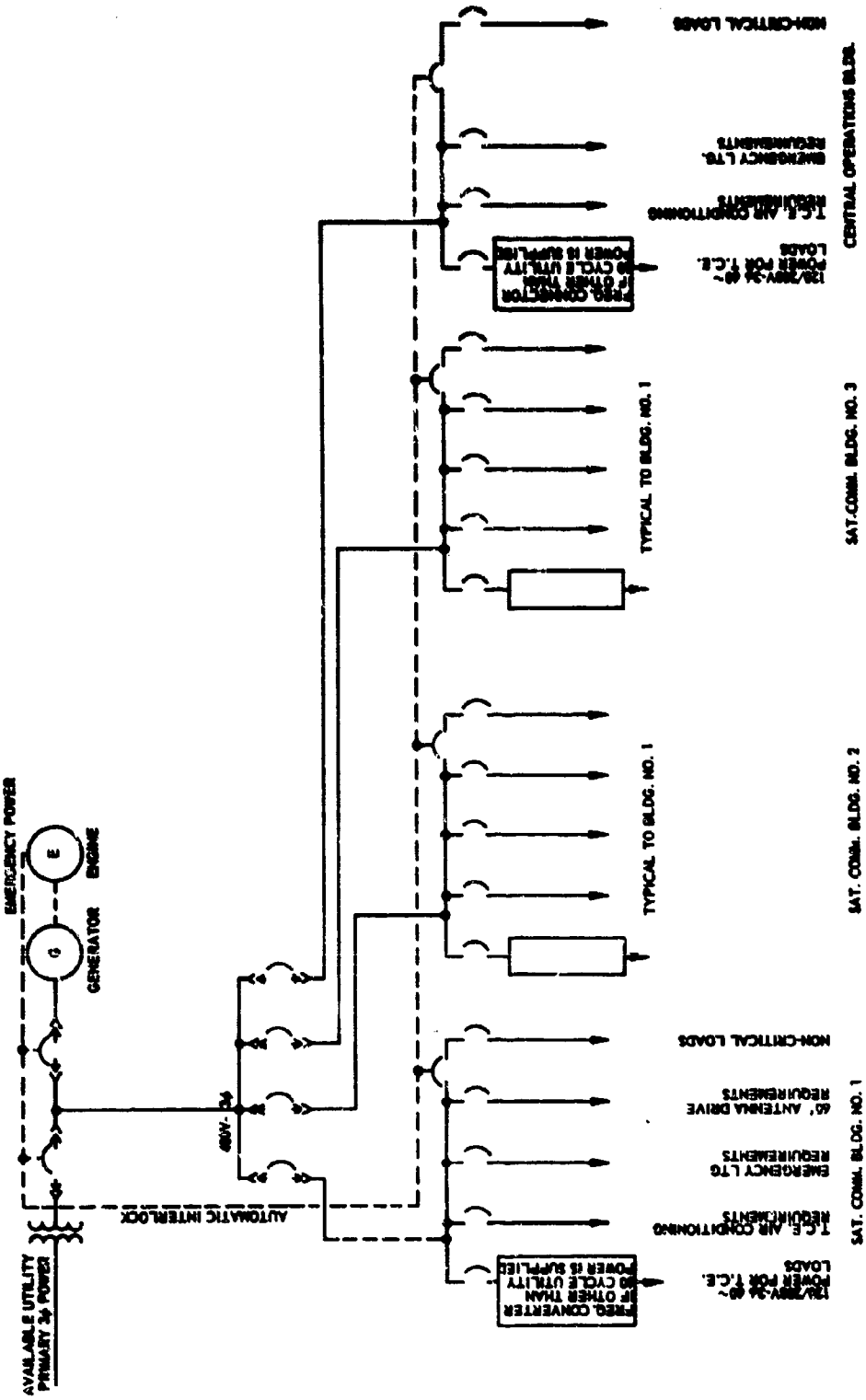


Figure 2-11 Station Power One Line Diagram

2.4.1.7 Power Equipment Ground. The method of grounding outlined below is not only for personnel safety but also for providing a direct path for any short circuit or leakage currents back to their source of supply. Establishing this direct path and attempting to isolate the Power Equipment ground from the Instrumentation ground system will eliminate instrumentation ground interferences that would ordinarily be caused by power equipment.

A power equipment ground shall be provided each building for non-technical power equipment grounding. (See Figs. 2-12 and 2-13.) This ground system shall emanate from the building substation where all transformer neutrals shall be grounded to the substation ground mat. The ground mat shall have a resistance to earth not to exceed 25 ohms measured by the standard three-point method.

The power equipment ground conductor where entering the building shall be insulated so that direct contact with the building instrumentation ground mat will be avoided. It shall enter the building only at the power distribution center area where it will be utilized for power equipment grounding requirements (See Fig. 2-13.) Service entrance distribution panel neutral buses shall be tied to this conductor, and all other subsequent neutrals and panel neutral buses shall remain isolated from power equipment ground except where it attaches to it at the Service entrance distribution panel. All 480 volt 3Ø feeders and branch circuits shall carry an insulated power equipment ground conductor in the power conduit as shown on Figure 2-13. All 120 volt 1Ø and 120/208 volt 3Ø circuits shall be considered as having a power equipment ground via the supplying conduit system. The isolated instrumentation ground system is discussed in Paragraph 2.4.2.8.

2.4.1.8 Substations. Substations shall be of the outdoor enclosed type to minimize electrostatic interference and radiation. Substations shall be protected on the primary side with fuse cutouts.

2.4.1.9 Primary Power Cable. Primary power cable shall be three-conductor with galvanized steel armor protected by a polyvinyl chloride jacket. Shielding and insulation will comply with IPCEA specifications. It may be

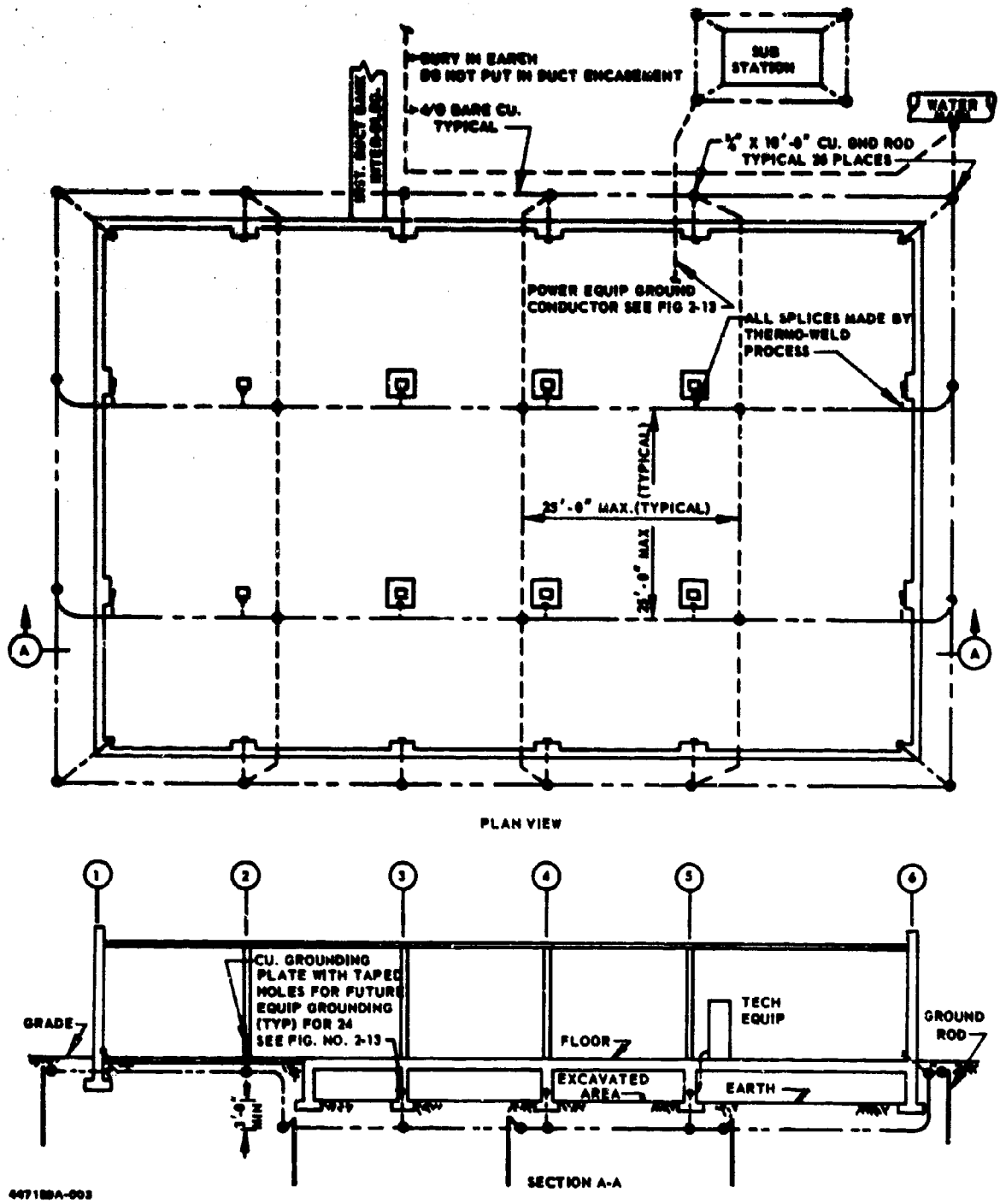


Figure 2-12 Instrumentation Grounding System

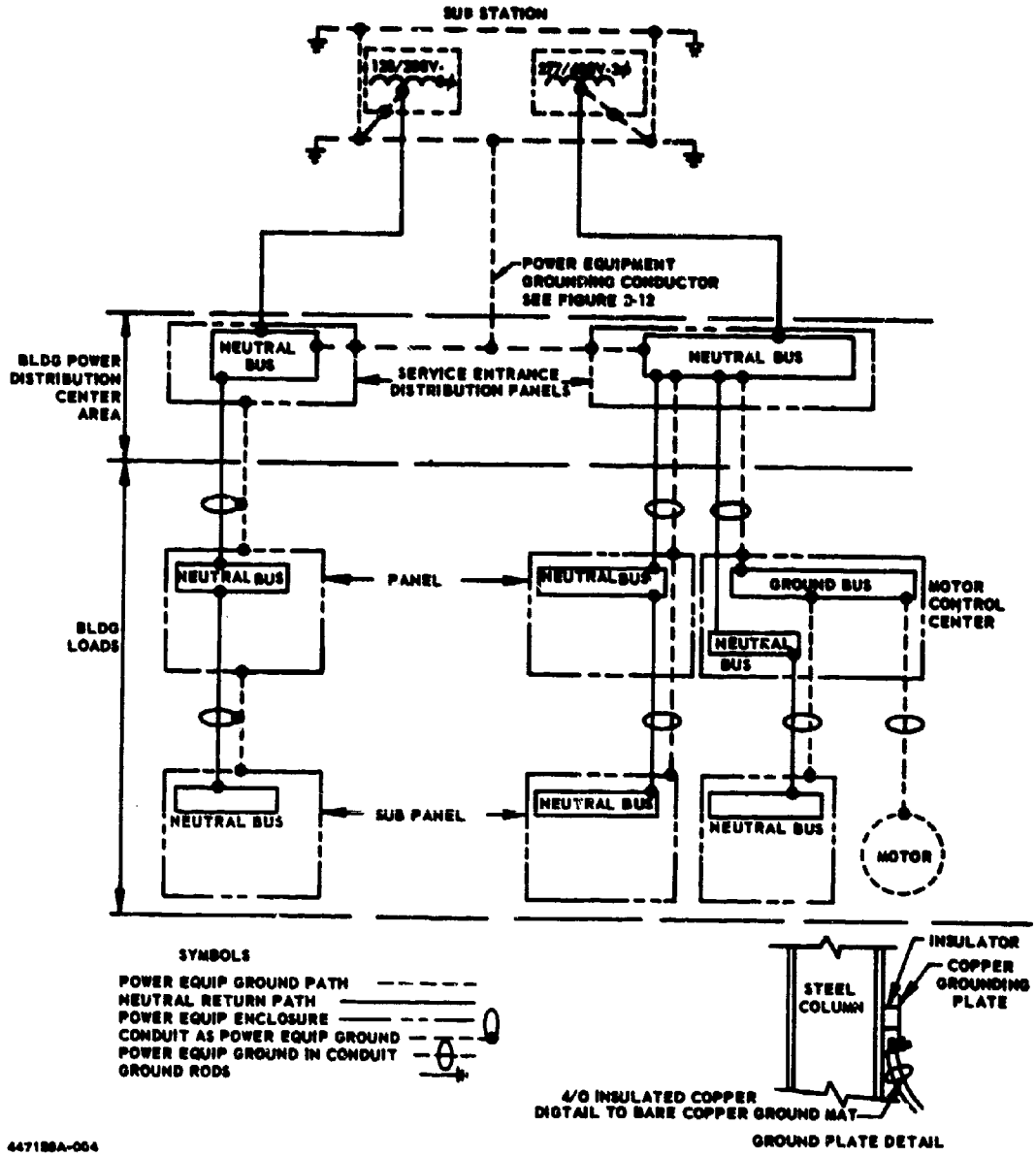


Figure 2-13 Power Equipment Grounding Riser Diagram and Grounding Plate

run as direct burial or run in the same duct bank as instrument cabling, as long as it is run in its own duct, and separated 6 inches minimum from instrumentation ducts. It shall not occupy the same manhole or terminating enclosure with instrumentation cables. Cable shall be 3 ft 6 in. minimum below grade. Maximum pulling distance shall not exceed 500 feet. All power lines within 1000 feet of receiver buildings shall be installed underground.

2.4.2 Technical Equipment Requirements

2.4.2.1 Panelboards. Panelboards shall be circuit-breaker-type consisting of thermal magnetic units, and shall be able to receive 100-ampere E-frame breakers with bussing, number, type, and rating of circuit breaker as determined from T.C.E. lists. It is recommended that panel space for future installation of branch circuits be reserved equal to 50 percent of the circuit requirement as indicated on the T.C.E. list. This reserve will provide for new requirements that may develop in the future. T.C.E. panels shall be centrally located in T.C.E. areas or in larger T.C.E. rooms. Individual panels in small T.C.E. rooms are not required.

2.4.2.2 Loads Served. T.C.E. panels shall supply the following:

a. T.C.E. equipment
b. Receptacles in T.C.E. rooms
c. Receptacles in test, calibration and maintenance room work benches.

The T.C.E. lists on the room layout present in tabular form the anticipated operating load in kw for each building technical facility. These loads are minimum estimated operating loads based on the size and number of technical equipment presently contemplated to comprise the requirement of the station.

2.4.2.3 Feeders. Feeder capacity shall be determined on the basis of estimated maximum demand. Demand factor for all T.C.E. rooms is 1.0. The demand factor for test calibration and maintenance rooms is 0.5. It is

recommended that sufficient spare feeder capacity be reserved equal to 50 percent of the maximum demand, as indicated by the T.C.E. lists on the room layouts. This will permit providing additional power to these rooms as required.

2.4.2.4 Receptacles. Receptacles for T.C.E. use shall conform to Drawing FL-SK-173 (Fig. 2-14), to fulfill the requirements of 60-cycle power. An equivalent schedule of receptacles is required for 50-cycle power. The 50-cycle and 60-cycle-power receptacles shall not be compatible.

2.4.2.5 Lighting. All T.C.E. rooms shall have a maintained illumination level of 50 foot-candles. Fixtures shall be of the fluorescent type. Antenna support structure rooms shall have an illumination level of 20 foot-candles.

Sufficient emergency lighting fixtures shall be fed from an emergency lighting panel to give T.C.E. rooms adequate illumination to perform primary functions during interruption of main power source.

2.4.2.6 Instrumentation Ducts. All major structures except boresight towers and power plant will be interconnected with 4-inch instrumentation ducts. The ducts will terminate within the building. Spacing between pull points (manholes) will not exceed 250 feet. Instrumentation ducts shall not be closer than six inches from a shielded power cable duct. Top of duct bank shall be minimum 2 foot 0 inch below grade (see Instrument Duct Plan Fig. 2-15).

2.4.2.7 Manholes. Manholes will be reinforced concrete with pulling irons on each of four walls.

2.4.2.8 Instrumentation Ground System. An instrumentation ground system shall be installed in each building according to Figures 2-12 and 2-14 in order to afford good earth contact for all T.C.E. equipment. Where copper grounding plates are supported from building steel they shall be insulated from it in order to isolate probable building steel interferences. Grounding conductor between the T.C.E. equipment and the grounding plates will be installed by

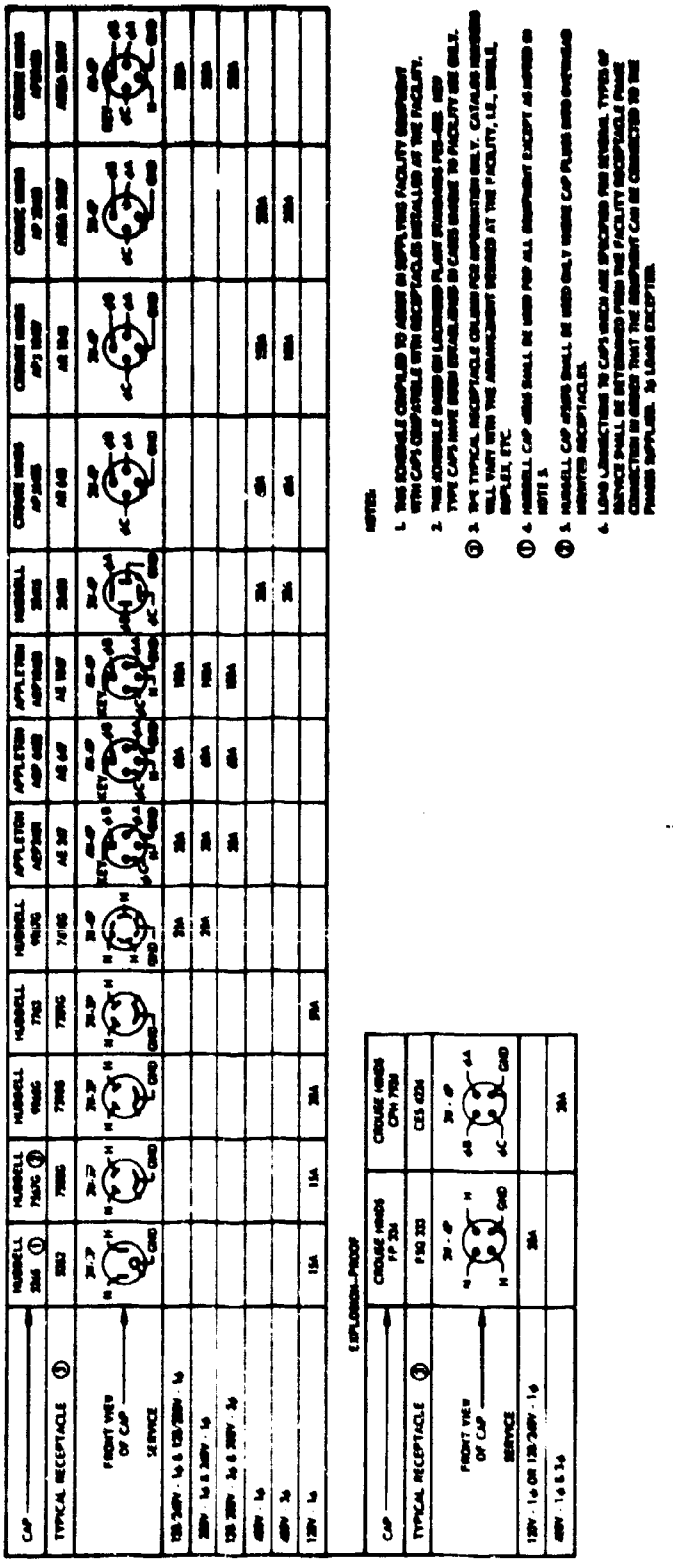


Figure 2-14 Standard Electrical Caps

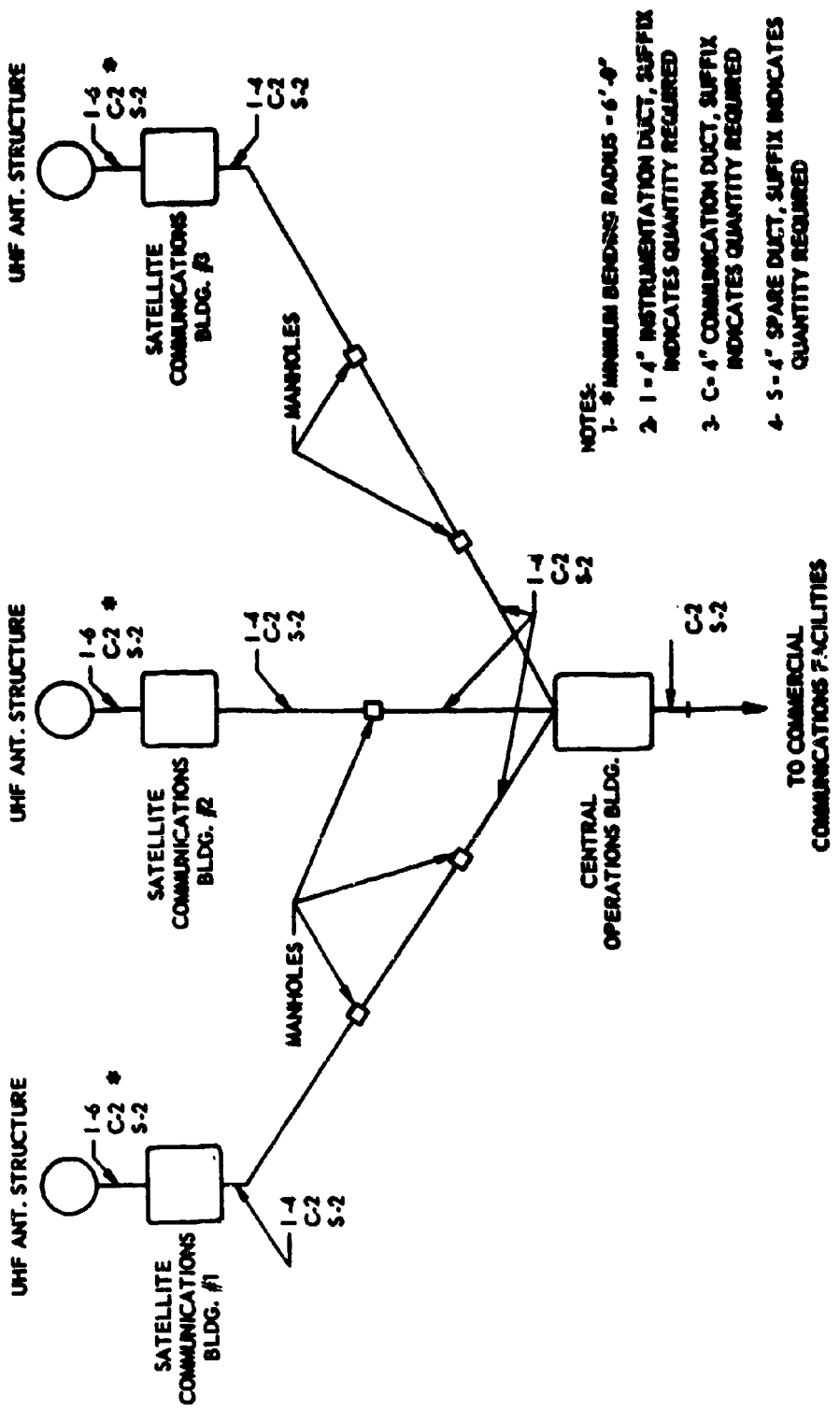


Figure 2-15 Instrumentation Duct – Block Diagram

the installation contractor. Resistance to earth in the system shall not exceed 1.0 ohm measured by the standard three-point method.

2.4.2.9 (Deleted).

2.4.2.10 Signal Transmission Conductors. Maximum length of signal transmission conductors from the antenna to the directly associated equipment shall not exceed 200 circuit feet for the satellite communication facilities.

2.4.2.11 Radio Frequency Filters. All electrically operated machinery in the technical facility which will produce RF interference will require R.F. line filters. This will include equipments which have a commutator, slip ring or any continuous arcing device.

Fluorescent fixtures in the satellite communications buildings shall have R.F. line filters and shields which suppress r-f radiation. Fluorescent fixtures in the central operations building need only have r-f line filters.

All shielding and line filters used at the technical facilities shall be designed to be effective throughout the entire RF spectrum from HF thru UHF. Effectiveness of the over-all noise reduction effort shall be such that spurious locally generated RF noise levels in the vicinity of the receiving antenna equipment shall be less than 0.1 microvolt/meter in the 2 KMC region, when referred to a 10 KC bandwidth.

2.4.2.12 Radiation Hazard. Provide an interlock system at personnel access door leading into the radome, which will automatically de-energize the command transmitter equipment whenever the access door is opened. A manual reset provision of the interlock, together with a visual indicating device located near the door is required.

SECTION 3
TECHNICAL EQUIPMENT STORAGE REQUIREMENTS

The station mission requires 24-hour daily operation with sufficient technical equipment spares on hand to maintain three sets of data receiving-transmitting equipment. To accomplish this, a technical equipment spare parts storage of 225 linear feet of seven-feet-high by two-feet-wide shelving and bin storage is required (approximately 1200 square feet).

Administration support consisting of stationery supplies and document reproduction will require 40 linear feet of seven-feet-high by two-feet-wide shelving, with an additional 18 linear feet of 3 feet by 2 feet by 7 feet high storage cabinets (approximate total of 300 square feet).

Facility maintenance for the three satellite communications buildings, three antenna and radome structures, and one central operations building will require the following:

a. Shelving and bin storage: 7 feet high by 2 feet wide - 225 linear feet (approximately 1200 square feet)

b. Bulk storage area: 2500 square feet
This bulk storage area will contain all spare parts, motors and other components to maintain the facilities and the mechanical equipment, especially air-conditioning, within the buildings.

A shipping and receiving area of 650 square feet will be required in the main storage building. This will include 200 square feet for essential office functions.

All of the above storage requirements are to be provided in an indoor heated area. Approximately 8,000 square feet of warehouse space or indoor heated area is required for the temporary storage of the shipments received during the period of initial equipment storage and for overflow

storage. This facility is desirable as near to the tracking station facilities as either newly constructed storage areas or use of existing storage structures will permit.

SECTION 4
PERSONNEL REQUIREMENTS

The initial estimates of total technical requirements for permanent station operation are outlined in Figures 4-1 and 4-2. Figure 4-1 is an organizational chart showing the estimated station functions and identification of technical personnel requirements by descriptive job title. Figure 4-2 shows the planned phasing of contractor and permanent station technical personnel manning through the installation and checkout phases and for final station operation. These personnel figures are for technical facilities planning purposes only. Total technical and support personnel requirements will be furnished in the Air Force approved Qualitative Personnel Requirements Information (QPRI) report.

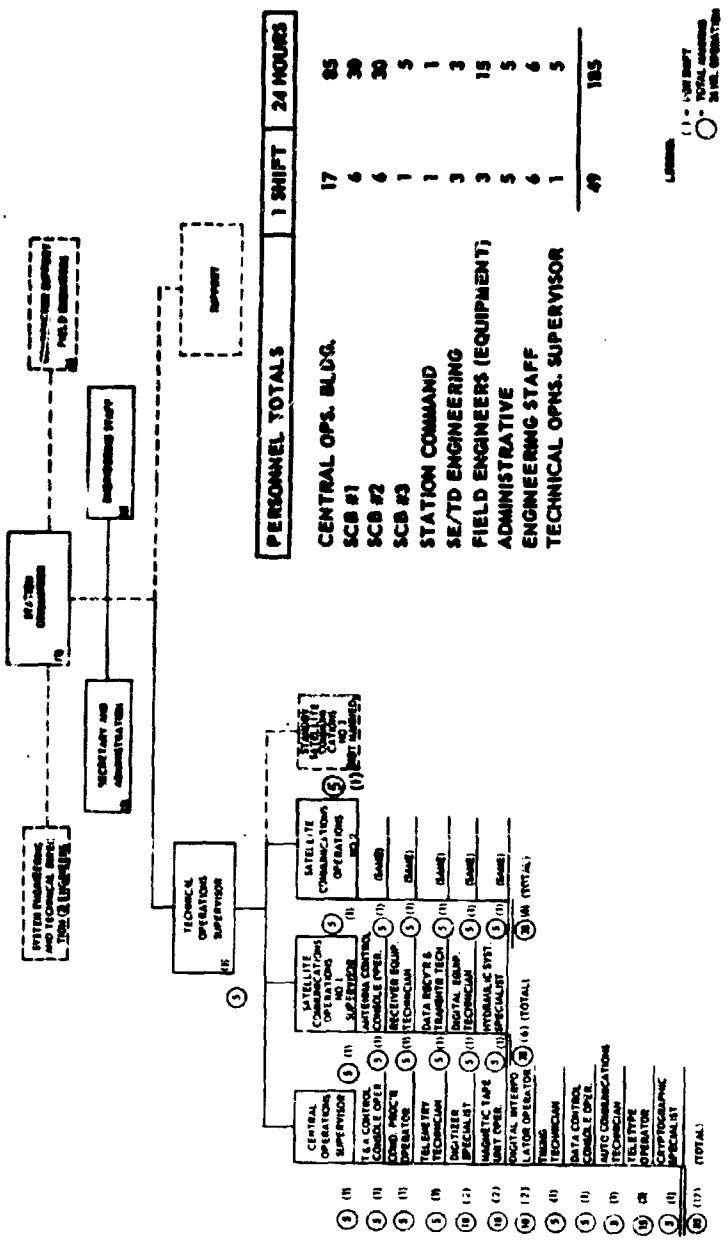


Figure 4-1 Technical Personnel Estimate

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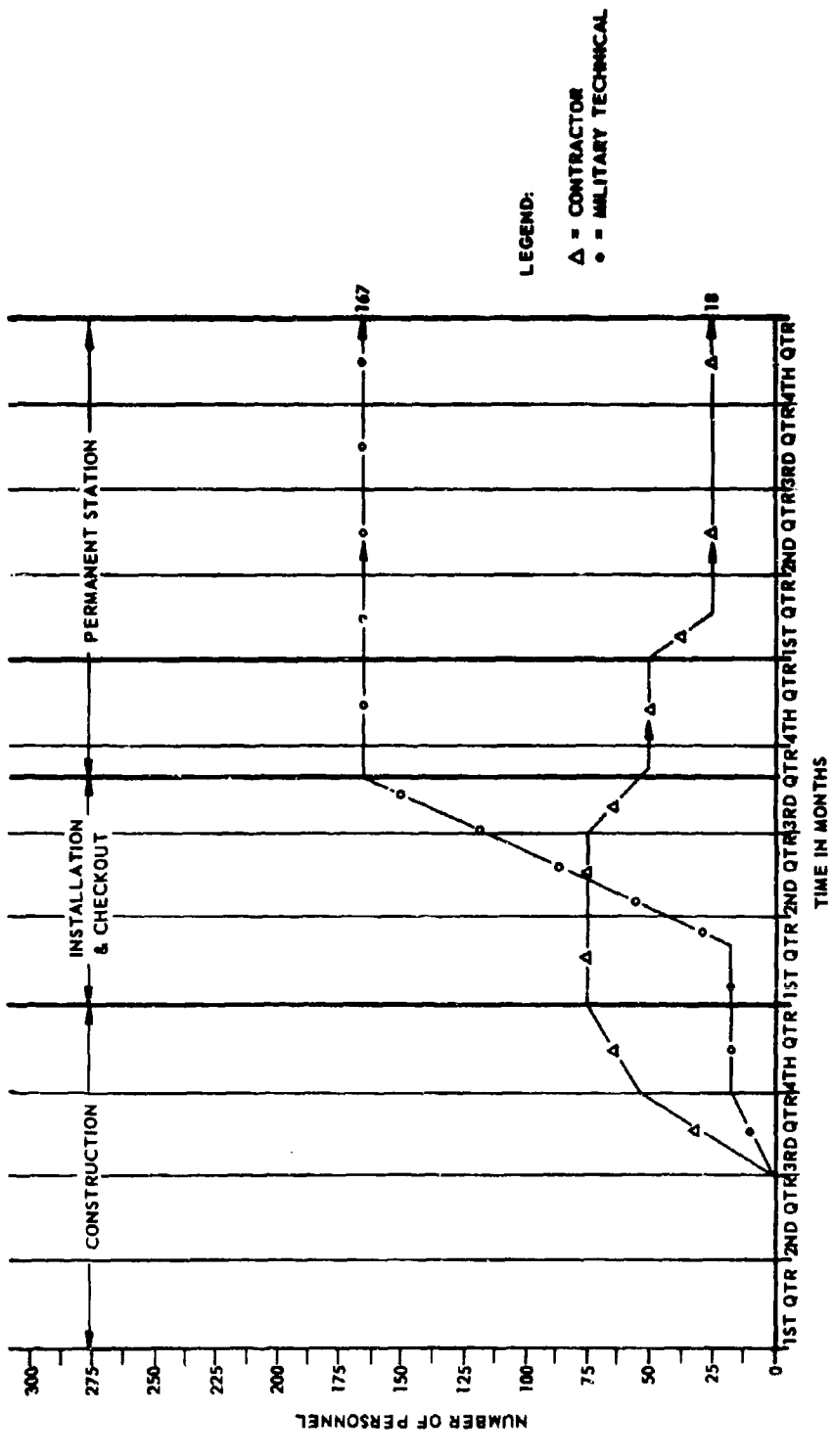

Figure 4-2 Contractor and Permanent Station Personnel Phasing

SECTION 5
SECURITY REQUIREMENTS

5.1 FENCING

Fencing ~~will~~ meet the following specifications:

a.	Type:	Chain link No. 9 gauge
b.	Height:	Seven feet, plus three strands of barbed wire angled away from periphery of the area
c.	Location	A minimum of ten feet from the area enclosed. Consideration should be given to the space within the fence required for outside building maintenance, walkways, and traffic around buildings.
d.	Clearance:	The interior space between fence and building or structure will be cleared. The space outside of the fence enclosure will be cleared for a minimum of 25 feet from the fence.
e.	Protection:	Security fencing shall include protection of boresight towers, underground instrumentation duct installations, and all technical facilities.

5.2 LIGHTING

Lighting will meet the following specifications:

a. Entrances: Flood lighting with a minimum intensity of two foot-candles is required for areas where recognition, identification, and reading is required.

b. General perimeter areas: Flood lighting of 0.2 foot-candles minimum intensity in required outside of fenced areas for a distance of five feet from the perimeter fencing. This intensity is to be determined by taking meter readings horizontaloy at ground level.

c. Spaces around buildings and structures: Flood lighting of 0.2 foot-candles minimum intensity is required around buildings and structures when they are separated by large distances within a perimeter fence and/or when terrain conditions restrict surveillance of the enclosed area.

d. **Location of light source: Lights may be located on enclosed buildings or structures or on poles if the poles are mounted inside the enclosed area.**

5.3 SECURITY GUARD HOUSE

See Paragraph 2.2.5.10

SECTION 6
INTRASTATION COMMUNICATIONS FACILITIES PLAN

6.1 GENERAL

This section describes for a typical MIDAS tracking and data acquisition station the required intrastation operational, and administrative voice communications installations. The requirements established in this section include the networks for operational intercommunications, administrative telephone and paging, and wire message service equipment. These communications facilities at the station will be under central control. An administrative switchboard will control and direct all incoming and outgoing telephone calls and operate the paging system. This switchboard will have the capability of connecting with alternate voice leased lines.

The requirements established in this section are those encompassing the overall communications service within and without the typical MIDAS station site. Terminations and certain equipment details are defined. Not included here are requirements for underground conduit, conduit bends, internal communications conduit, short duct runs, telephone outlets, and the 20-zone paging system speakers.* Operational voice communications requirements are covered in this document in Paragraph 6.2. Administrative voice communications requirements will be covered in Paragraph 6.3. Paragraph 6.4 lists the applicable specifications and documents.

6.1.1 Requirements of Communications Contractor

Additional requirements will be established by the communications contractor. The communications contractor will be responsible for (but not necessarily limited to) the following:

* *See Part 11, Basis For Design – Buildings and Structures, LMSD-447159, Facilities Design Criteria For MIDAS Operational Station, 28 September 1960 (Unclassified)*

a. Drawings for distribution cables

b. Drawings showing equipment arrangement of switchboard, dial station lines wire services, and dial equipment

c. The review, correction and approval of architectural and engineering drawings related to terminal size and location, cable distribution, and conduit size.

6.2 OPERATIONAL VOICE COMMUNICATION REQUIREMENTS

A system of networks in accordance with Figure 6-1 will be engineered to provide operational voice communications at the station. Pre-pass, post-pass, calibration and maintenance functions are to be provided.

6.2.1 Network Description

a. Net #1. Connects all positions involved in the over-all system checkout. During this checkout phase various integrated equipment systems are tested. During this phase, the master controller at the Tracking and Acquisition Control Console will conduct the test. Only the positions involved in providing information to him and following his commands are on this net.

b. Net #2. Considered to be supplementary to the equipment and operations status display network within the tracking system and will be used when information is needed in addition to that which is displayed. In a normal acquisition exercise in which no problems occur, this net will not be used.

c. Net #3A. Connects all necessary communication positions within the COB for purposes of accomplishing individual equipment systems checkouts. An equipment system checkout indicates in detail the operating condition of each equipment system (e.g., data receiving system, timing system) comprising the total system. Checkout or maintenance activities which require communication with other buildings may be accomplished by using the supervisory net, the PABX telephone system, the voice paging system or by patching together individual building maintenance and checkout nets.

d. Net #3B. This net, within the Satellite Communications Building #1, is used in the same manner as Net #3A.

e. Net #3C. This net, within the Satellite Communications Building #2, is used in the same manner as Nets #3A and #3B.

f. Net #3D. This net, within the Satellite Communications Building #3, is used in the same manner as Nets #3A, #3B and #3C.

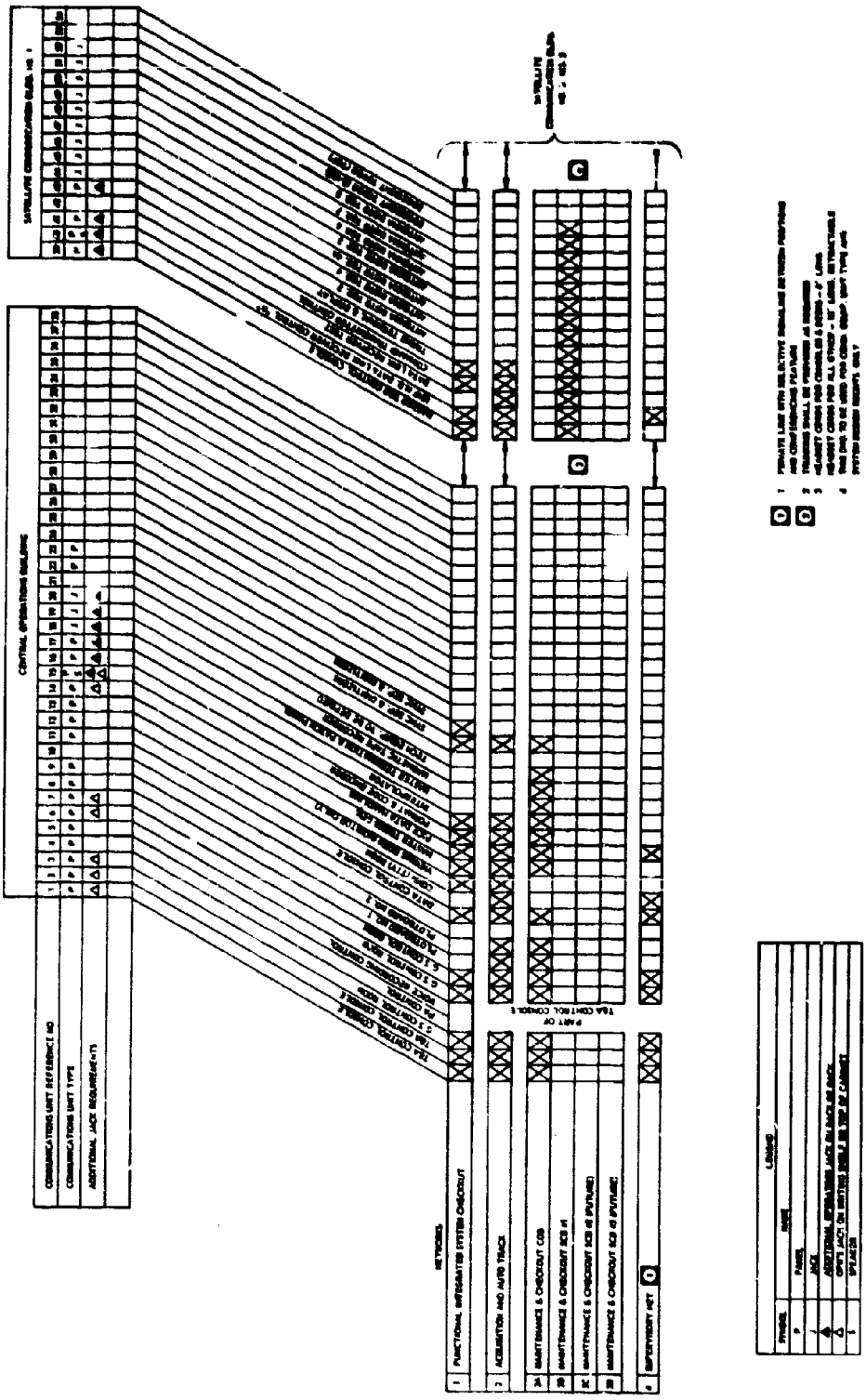

Figure 6-1 Station Operational Voice Intercommunication

g. Net #4. The purpose of this net is to provide for coordination between buildings at all times. The supervisory network is independent of all other networks, and is provided with:

(1) Selective signalling between all positions on the net.

(2) Conferencing capability between any of the stations in the net.

6.2.2 Communication Panels

Communication panels to be provided will contain:

a. Loudspeaker connection - minimum usage as indicated on Figure 6-1.

b. Switch - for placing the speaker on the nets or any direct line where required.

c. Two headset jacks - for either direct lines and/or nets. It should be possible to remote these jacks to the desk edge of console or edge of equipment racks.

d. Speaker amplifier and level control - areas indicated on Figure 6-1.

e. Dial - to allow access to administrative PABX with headset.

6.2.3 Operational Communication Location

Referenced Figure 6-1 indicates the equipment racks and consoles in the buildings where space has been allocated for communications panels, jack and/or both. These locations have been dictated by operation and/or maintenance requirements and will not be changed without proper notification of cognizant engineering organizations.

6.2.4 Intra-Station Operational Circuits

The following operational circuits (see Fig. 6-2) are required:

a. COB to Satellite Communications Building #1 (SCB #1)

6 - operational circuits

4 - dial (administrative) circuits

1 - signalling circuit

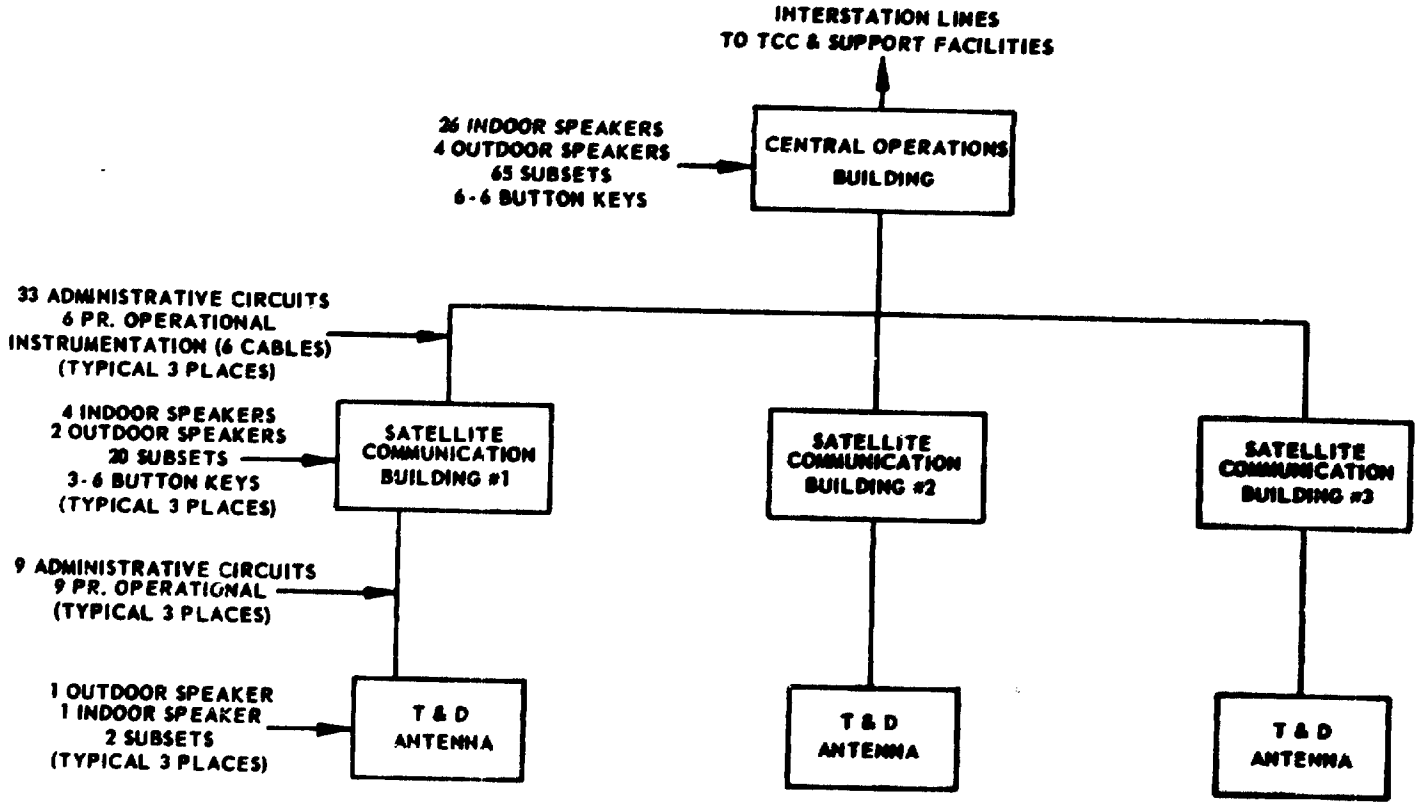

Figure 6-2 Station Cable Requirements

b. COB to SCB #2
   6 - operational circuits
   4 - dial (administrative) circuits
   1 - signalling circuit

c. COB to SCB #3
   6 - operational circuits
   4 - dial (administrative) circuits
   1 - signalling circuit

d. SCB #1 to Multi-purpose Antenna
   2 - operational circuits
   2 - dial (administrative) circuits
   1 - signalling circuit

e. SCB #2 to Multi-purpose Antenna
   2 - operational circuits
   2 - dial (administrative) circuits
   1 - signalling circuit

f. SCB #3 to Multi-purpose Antenna
   2 - operational circuits
   2 - dial (administrative) circuits
   1 - signalling circuit

6.2.5 Recording

A capability to record four channels controlled from the Tracking and Acquisition Control Console located in the COB, will be required as follows:

a. One track will record Nets #1 and #2 (alternately)

b. One track will record the supervisory net

c. One track will record conversations in the direct operational line to the TCC

d. One track will be used for back-up.

The capability must exist at the Tracking and Acquisition Control Console, located in the COB, to switch tracks as required.

6.3 ADMINISTRATIVE VOICE COMMUNICATION REQUIREMENTS

In order to interconnect the areas, intra-station voice communications equipment will be required as follows:

Locations	Public Address Speakers	Main Hand Dial Sets (MNHD)	Key Telephone Sets, 6 Button (KTS)	Operator Headsets
Security Check House	1 outdoor 1 indoor		1	
COB	26 indoor 4 outdoor	65	6	5
SCB #1	4 indoor 2 outdoor	20	3	3
SCB Antenna Support Structure #1	1 outdoor 1 indoor	2		
SCB #2	4 indoor 2 outdoor	20	3	3
SCB Antenna Support Structure #2	1 outdoor 1 indoor	2		
SCB #3	4 indoor 2 outdoor	20	3	3
SCB Antenna Support Structure #3	1 outdoor 1 indoor	2		
Emergency Power Plant	1 indoor	1		

6.3.1 Switchboard

Within the Central Operations Building, an automatic dial PABX (manned) is required to service and control administrative type communications within and without the station. It will also contain provisions for the following:

a. 200 line capacity (minimum) expandable to 300 lines
b. 15 trunks incoming (two-way) in rotary expandable to 25
c. 15 trunks, outgoing, expandable to 25
d. 3 intercept trunks
e. 10 attendant trunks ("0") level
f. 2 five (5) party conference jacks
g. Provision for terminating full period voice line from console to PBX for general distribution
h. Night connection - 2 lines.

6.3.2 Dial Telephone System

The dial telephone system should satisfy all of the support, administrative, and other communication requirements within the station. It would provide connection between any two dial telephones within the building or between any dial phone and available inter-office trunks for extended area service. This service would include connections to support facilities, other commands, and to extension toll lines.

6.3.3 Paging System

A twenty-zone paging system will be required to interconnect all elements of the T&A Station, and will consist of:

a. Operating Equipment. Two (2) master control units; one (1) located at telephone switchboard for general administrative paging, and one (1) in the console room adjoining the switchboard room. The console room unit will have override feature. Each control unit will be equipped with twenty (2) zone route keys capable of being used individually or in any grouping. The console room will have one (1) microphone, dynamic, with desk stand and spring loaded push-to-talk switch. One (1) pull-down

type microphone will be required for use by switchboard operator. One (1) microphone, dynamic, with spring loaded push-to-talk switch will be located in Security Check House. The Security Check House microphone is intended for use after close of business at switchboard. The switchboard operator will operate "Routing Keys" to all stations. This will enable the Security Guard near the Security Check House to page all stations.

b. Speakers. All indoor speakers will be equipped with volume control. Number of speakers has been stated previously.

c. Suggested Page System Zoning. The following zoning is suggested for incorporation into the twenty zone public address system:

Zone	Location
1	SCB #1 SCB Antenna Support Structure #1
2	COB
3	SCB #2 SCB Antenna Support Structure #2 Boresight Tower
4	SCB #3 SCB Antenna Support Structure #3

6.3.4 Wire Service

Wire message service equipment shall be provided and installed in the COB. This equipment will include:

a. One (1) alternate voice/100 WPM data teletype circuit

b. One (1) 60 WPM command administrative circuit using 28-ASR with 131B sub-sets for classified data.

c. Two (2) Data Circuits, full duplex, using Data Phone Model III at 1200 bits/sec with average error rate not to exceed 1 in 10^5 bits transmitted.

d. Provide third Data Phone Model III digital subsets at both ends of circuit operator-dial service.

e. Separate routes should be utilized wherever a station has more than one long line so as to minimize the chances for a simultaneous shut down. An RO-28 unit is required on the national weather circuit and is to be located in the COB.

f. All leased voice circuits will be terminated in the Tracking and Acquisition Console, located in the COB, with switching capability to the administrative switchboard.

6.3.5 Administrative Telephone Circuit Requirements (see Fig. 6-2)

a.	Central Operations Building	-90 Circuits
b.	SCB #1	-28 Circuits
	SCB Antenna Support Structure #1	-6 Circuits
c.	SCB #2	-28 Circuits
	SCB Antenna Support Structure #2	-6 Circuits
d.	SCB #3	-28 Circuits
	SCB Antenna Support Structure #3	-6 Circuits

e. Expansion, spares, or reliability factors are not included in the administrative telephone circuit requirements.

6.3.6 Terminals

The generally accepted rule for the selection of the size of distribution cable terminals is to provide approximately three cable pairs for each line that ultimately will be serviced by that terminal. Application of this rule usually will provide sufficient flexibility to accommodate unforeseen service requirements and rearrangements that may occur within the wiring limits for that terminal. Also it will allow uniform multiplying of cable pairs.

6.4 APPLICABLE DOCUMENTS

The following documents form part but not all of the specifications governing the system design:

a. Specifications, Military

MIL-D-5028B	Drawings and Data lists, Preparation of Manufacturers (for Production, Aeronautical and Associated Equipment)
MIL-E-4158B	Electronic Equipment, Ground; General Requirements for
MIL-D-8512	Design, Special Support Equipment

MIL-E-4970	Environmental Testing, Ground Support Equipment; General Specifications for
MIL-I-26600	Interference Limits, Test and Design of Requirements, Aircraft Electrical and Electronic Design.

b. Publications

(1) Engineering Process Bulletin

PB 13	Protective Finishes, Ground Support Equipment

(2) Air Force - Navy Aeronautical Bulletin

Number 143d	Specifications & Standards, Use of

(3) Technical Orders (AF)

T.O. 31W3-1-4	Telephone Outside Plant Engineering, Building Conduit
T.O. 31W3-1-8	Telephone Outside Plant
T.O. 31W-1-16	Telephone Plant Engineering, Protection
T.O. 31W-10	Telephone Plant Engineering, Transmission
T.O. 31W-1-5	Telephone Outside Plant Engineering, Joint Usage
T.O. 31W3-1-17	Telephone Outside Plant Construction, Drop and Block Wiring and Station Installation.
T.O. 31W3-1-13	Telephone Inside Plant Engineering
T.O. 31W-1-15	Plant Engineering, Electrolysis

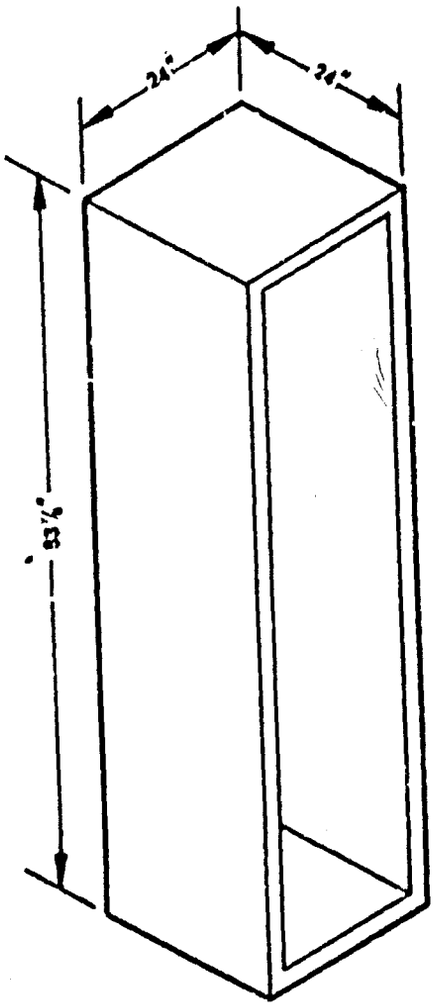

Figure A-1 Typical Equipment Rack

Preceding Page Blank

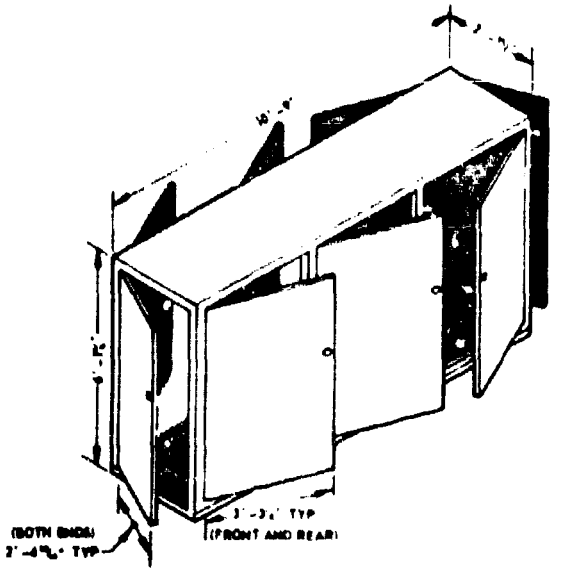

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Figure A-2 Typical AFR Cabinet – PICE Equipment

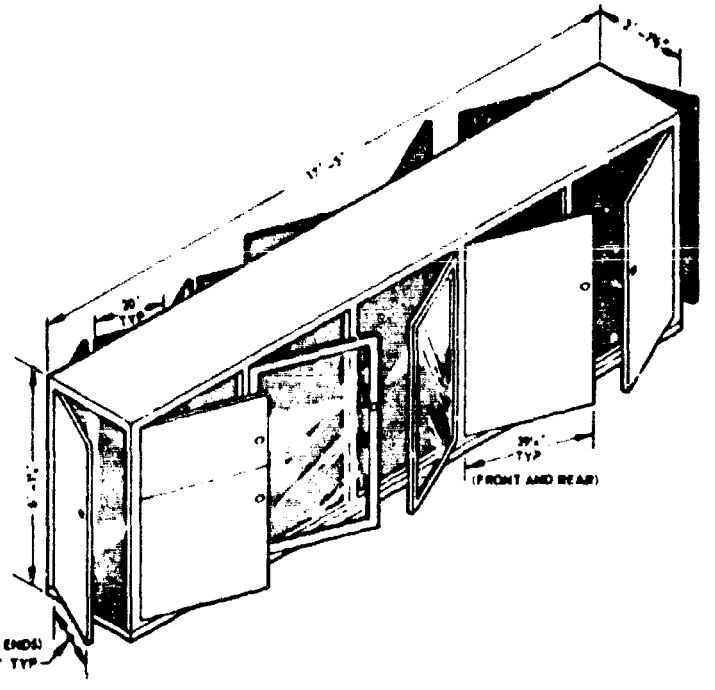

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Figure A-3 Typical Memory Cabinet – PICE Equipment

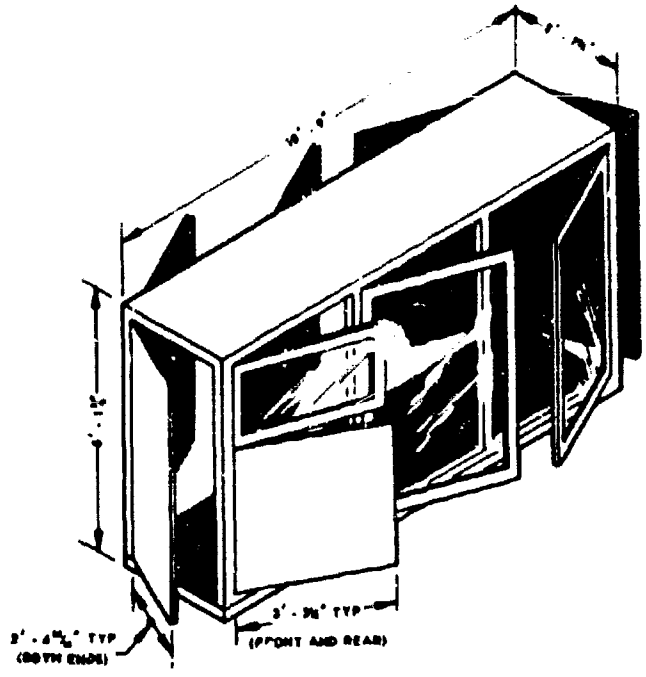

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Figure A-4 Typical Control Cabinet – PICE Equipment

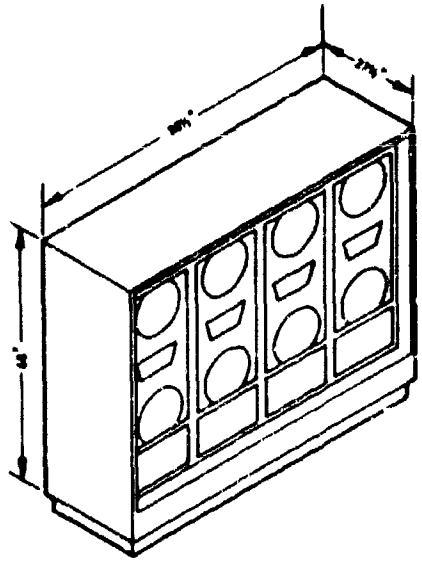

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Figure A-5 Typical Magnetic Tape Cabinet – PICE Equipment

BIBLIOGRAPHY

LMSD-447159, Facilities Design Criteria, MIDAS Operation Station, Part I - Technical Equipment Requirements, 31 August 1960; Secret

LMSD-362451, Report on Trip to United Kingdom MIDAS Station Site, 16 June 1960; Confidential

LMSD-445954, Site Selection Survey for United Kingdom MIDAS Station, 14 October 1959; Secret

LMSD-411348, Design Criteria and Outline Specifications, Project Sentry, Development/Operational Tracking Station, New Boston, New Hampshire, 13 October 1958; Secret

LMSD-445563, MIDAS Program - Defense Alarm Station Facilities Criteria (Revision 1), July 1959; Unclassified

LMSD-445488, MIDAS Program - United Kingdom Station Siting Criteria, 15 July 1959;

F2/1086, Site Investigation for United Kingdom Station, Ground Engineering Limited, Manor Way, Boreham Wood, Herts, Great Britain, May 1960, Unclassified

A Guide to Current Practice 1959, Second Ed., The Institution of Heating and Ventilating Engineers, 49 Cadogan Square, London SW-1, Great Britain.